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Tallahassee-Leon County Wastewater Management
Tallahassee, Leon County, Florida

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This Draft EIS has been prepared in response to issues raised in opposition to portions of the Tallahassee-Leon County 201 Facilities Plan. The EIS addresses wastewater management needs for growth areas which will not be served by 201 facilities already approved by EPA. Alternatives for wastewater management in the study area were developed and evaluated with emphasis on protection of the groundwater resources and sensitive natural systems such as floodplains and wetlands.

The Draft EIS preferred alternative includes the expansion of the existing system until the approved facilities have been constructed. New growth in wastewater generation will be handled by on-site systems, small community systems, and by tying into the existing system.

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Environmental Impact Statement

Draft

Tallahassee-Leon County Wastewater Management Tallahassee, Leon County, Florida

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SPRINGFIELD, VA 22161

Draft
Environmental Impact Statement

for
Tallahassee-Leon County Wastewater Management
Tallahassee, Leon County, Florida

prepared by
U.S. Environmental Protection Agency
Region IV, Atlanta, Georgia 30365

This Draft EIS has been prepared in response to issues raised in opposition to portions of the Tallahassee-Leon County 201 Facilities Plan. The EIS addresses wastewater management needs for growth areas which will not be served by 201 facilities already approved by EPA. Alternatives for wastewater management in the study area were developed and evaluated with emphasis on protection of the groundwater resources and sensitive natural systems such as floodplains and wetlands.

The Draft EIS preferred alternative includes the expansion of the existing system until the approved facilities have been constructed. New growth in wastewater generation will be handled by on-site systems, small community systems, and by tying into the existing system.

The comment period for the Draft EIS will remain open until November 17, 1981. Comments or inquiries should be forwarded to:

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8/26/81
Date

EXECUTIVE SUMMARY FOR ENVIRONMENTAL IMPACT STATEMENT

TALLAHASSEE-LEON COUNTY WASTEWATER MANAGEMENT

TALLAHASSEE-LEON COUNTY, FLORIDA

Draft (X)

Final ( )

Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30365

Type of Action: Administrative Action (X)
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EXECUTIVE SUMMARY

PART A. EXISTING PROBLEM

In response to rapid growth in Leon County, wastewater facilities planning studies were conducted in 1972 and 1973 to determine how service could be expanded in a cost-effective and environmentally sound manner. These studies identified a need for additional facilities, the costs of which were believed too high for the residents of the County and the City of Tallahassee to bear alone. As a result, it was decided to apply for federal grants to fund a majority of the facilities costs, and a 201 Facilities Plan was prepared by William M. Bishop Consulting Engineers, Inc.

The draft Tallahassee-Leon County 201 Plan was approved in April, 1977, by the City and County Commissions and received initial approval from the Florida DER and the EPA. EPA subsequently decided to release Step II grants for only those facilities which would relieve existing water quality problems. This decision was made in part as a result of opposition from citizens and private organizations to portions of the 201 Plan. It was further decided that an EIS would be prepared on those portions of the 201 Plan which support future growth that may result in significant environmental impacts.

EPA has funded only those facilities which relieve existing water quality problems under the first phase of 201 planning. These facilities are:

PHASE 1

Section 1-A (Completed or Under Construction)

- Upgrading of 2.5 mgd Southwest Treatment Plant
- New Southwest Holding Pond and Pumping Station
- New 22.5 mgd Southwest to Southeast Force Main
- New 10.0 mgd Southeast Sprayfield, Holding Pond and Pump Station

Section 1-B (EPA-Approved and Awaiting Construction)

- Expansion of T. P. Smith Plant to 15.0 mgd
- Abandonment of Lake Bradford and Dale Mabry Plants
- Expansion of Southeast Sprayfield to 17.5 mgd
- New 17.5 mgd Sludge Handling Facility
- Additional Interceptors and Pump Stations

Those proposed facilities under the Phase 2 portion of the 201 Plan which are covered by this EIS are:

Phase 2 (Subject to EIS Study)

- New 5.0 mgd Northeast Plant
- New 60,000-Linear-Foot Force Main to Southeast Sprayfield from Northeast Plant
- Expansion of 2,000-Acre Southwest Sprayfield
- Expansion of T. P. Smith Plant Beyond 15.0 mgd
- Additional Interceptors to Growth Areas

The EIS was initiated because of the following issues raised by organizations and individual citizens:

1. Public health risks may be associated with land application of wastewater.
2. Wastewater flow projections may be too high.

3. Potential detrimental impacts to wetlands may result from development in northeast Leon County.

4. Northeast treatment plant may be incompatible with residential use of the area.

5. The construction, operation, and maintenance of the Northeast plant force main to the Southeast sprayfield may have detrimental impacts on wetlands and the dam at Lake Lafayette.

6. The renovation of the Lake Bradford plant may be more cost-effective than closing it.

7. Any of the alternatives may have potential impacts on the habitats of threatened and endangered flora and fauna.

PART B. DESCRIPTION OF ALTERNATIVES

Four comprehensive alternatives have been developed for the Tallahassee-Leon County area. Each of these alternatives incorporates complete wastewater management systems for the area. The available collection, treatment and disposal options for wastewater management were screened under the EIS, and the feasible options for the study were determined.

In developing and evaluating the alternative systems, the following were considered:

1. The EIS wastewater flow projection for the planning period (through the year 2000) is 22.3 mgd without conservation measures. The 201 Plan-projected flow for the year 2000 is 30.4 mgd.

2. The EIS identifies three major wastewater-generation areas: the southwest, the northeast, and the southeast. The alternatives have been developed for serving these three areas.

3. The evaluation of conservation measures for the EIS study showed that a flow reduction of 2.4 mgd by the year 2000 is feasible. The costs and structural configurations of each alternative are described with and without conservation.

4. The only wastewater disposal options evaluated in detail were land application options. Surface water discharges and other options were eliminated as inappropriate, for cost, environmental or technical reasons.

5. Florida DER rules require full secondary, treatment prior to application of effluent to the land. EPA decisions regarding funding of pre-application levels of treatment prior to land application are determined on a case by case basis.

6. The Dale Mabry treatment plant will be closed.

7. The Lake Bradford treatment plant will be closed unless treatment needs for the southwest service area exceed 21.7 mgd, the point at which continued operation becomes cost-effective.

The alternative wastewater management systems developed and evaluated for the study area are described as follows:

1. Alternative System 1A

   A new treatment plant will be constructed in the northeast, and the T. P. Smith/Southwest treatment facility will be expanded beyond the Phase I capacity of 17.5 mgd. A northeast treatment plant will provide service in the northeastern growth areas of Leon County. In addition, sewers will be extended to developed portions of the northeast presently served by on-site and small community systems. The expanded T. P. Smith/Southwest Plant will serve the Southwest and Southeast service areas. Effluent from the T. P. Smith/Southwest plant will be disposed of at the expanded Southeast Sprayfield. The Northeast plant effluent will be disposed of by rapid infiltration at a northeast disposal site.

2. Alternative System 1B

   This alternative is the same as 1A except that the treated effluent from the Northeast plant is conveyed to the expanded Southeast Sprayfield for disposal.

3. Alternative System 2

   For this alternative, existing facilities serve as a regional treatment system. The structural configuration depends on the decision whether or not to implement conservation measures. Without conservation measures, the most cost-effective system is continued operation of the Lake Bradford plant at 4.5 mgd and expansion of the T. P. Smith/Southwest plant by 0.3 mgd. With conservation measures, an expanded T. P. Smith/Southwest treatment facility will serve the entire sewered area as a regional treatment plant with a 19.9-mgd capacity.

4. Alternative System 3

   Under this alternative, a Southeast treatment plant is to be constructed to supplement the treatment capacity of the expanded T. P. Smith/Southwest facility. The Southeast plant will serve growth areas in the Southeast and Northeast. The T. P. Smith/Southwest plant will serve projected growth areas in the Southwest and the existing service area. For both plants, wastewater will be disposed of at the Southeast Sprayfield.

5. Alternative System 4 (No-Federal-Action Alternative)

   The No-Federal-Action Alternative is described by considering the present situation in the Tallahassee-Leon County area and projecting future conditions with no changes in public policy or private practices. Expansion of the present wastewater system will continue only until the limits of Phase I expansion are reached. New growth in wastewater generation will be handled by on-site and small community systems. Population infilling will take place in the City's service area and some additional sewering will be necessary. To be constructed under this alternative is the proposed Southwest System (less the interceptor which extends west along Jackson Bluff Road and the interceptor which extends along the Woodville Highway) including the J-series interceptor, which will serve an area unsuited for on-site systems in the Meginnis Arm area of Lake Jackson.

Each alternative was evaluated with respect to cost, environmental impacts, technical feasibility, and implementability. The following table contains a summary of the evaluation of alternatives.

PART C. PREFERRED ALTERNATIVE

Alternative 4 (No-Federal-Action) has been selected as the most cost effective and environmentally sound alternative for the draft EIS. The EIS failed to demonstrate a justified need for the 201 Plan's Phase II facilities represented by the structural alternatives. The remainder of the Phase I facilities which have been approved by EPA will serve all existing and some future needs. The EIS projected that by the year 2000, the wastewater flow from within that area now served by the City, without flow measures, will approximate the available 17.5-mgd capacity at the T. P. Smith/Southwest treatment facility. The projected growth areas are suited to the use of on-site and small community systems.

Data on soils in the growth area support the use of on-site systems. The Leon County Health Department indicates that on-site systems operate properly when their construction follows the basic rules governing their placement. The few failures of on-site systems that have occurred in the northeast growth area are a result of poor siting and poor construction.

The importance of groundwater quality in an area where groundwater is the sole potable water supply is a most critical consideration. The EIS shows no significant adverse impact to groundwater quality from the use of on-site systems and small community systems in the growth areas. The impacts on down-gradient city water supply wells were fully considered in the selection of Alternative 4. The geological formations in northern Leon County, including the projected growth areas, should provide adequate protection for the drinking water (Floridan) aquifer.

Another issue of the EIS is that potential detrimental impacts to wetlands may result from development in northeast Leon County. Properly implemented, the recommended alternative decreases the potential for development of marginal lands and environmentally sensitive lands such as wetlands, floodplains, and high groundwater areas.

For the implementation of Alternative 4, the importance of proper siting, construction, and operation and maintenance of on-site and small community systems cannot be overemphasized. If these systems are used extensively and are poorly maintained, the potential for adverse environ-

SUMMARY OF ALTERNATIVES

Alternatives	Description of Alternatives	Total Present Worth ($\$ \times 10^6$)	Pros	Cons
1A	T.P. Smith/SW plants to serve SW & SE with disposal at SE spray field. NE plant to serve NE with disposal in NE.	$34.8 (29.4)*	1. Moderate Cost 2. Development flexibility in density and location	1. City's drinking water wells down gradient of proposed rapid infiltration site 2. Increased potential for nonpoint source pollution due to increased impervious surfaces from higher density development and opportunity to develop floodplains, wetlands and high groundwater areas. 3. NE plant considered incompatible with existing land uses by area residents 4. Construction impacts on surface waters & plant & animal resources 5. Cost to homeowners from tap-on fees and sewer use fees
1B	Same as 1 above except NE plant effluent disposal at SE sprayfield.	$52.7 (46.0)*	1. Less impact on groundwater than 1A 2. Development flexibility in density & location 3. Alternative most desired by the City	1. Highest cost structural alternative 2. Increased potential for non-point source pollution due to increased impervious surfaces from higher density development and opportunity to develop floodplains, wetlands and high groundwater areas 3. Construction impacts on surface waters & plant & animal resources

* Cost if flow reduction measures are implemented

SUMMARY OF ALTERNATIVES (Cont'd.)

Alternatives	Description of Alternatives	Total Present Worth ($x10^6)	Pros	Cons
1B(Cont'd.)				4. Added construction impacts from transmissi line to SE sprayfield 5. Cost to homeowner from tap-on fees and sewer use fees
2	T.P. Smith/SW plants & Lake Bradford plant, if needed, serve as regional plants with disposal at SE sprayfield.	$31.5 (27.6)*	1. Lowest cost structural alternative 2. Maximum use of existing facilities 3. Development flexibility in density & location 4. Makes full use of already constructed force main to SE sprayfield	1. Increased potential for nonpoint source pollution due to increased impervious surfaces from higher density development and opportunity to develop floodplains, wetlands and high groundwater areas 2. Construction impacts on surface waters & plant & animal resources 3. Long interceptors potentially causing anaerobic conditions & treatment problems 4. Cost to homeowner from tap-on fees & sewer use fees
3	T.P. Smith/SW plants to serve SW & SE. NE served by SE plant. All disposal at SE sprayfield.	$40.0 (34.3)*	1. Development flexibility in density & location 2. Avoids public acceptance problems of NE plant	1. High cost 2. Increased potential for nonpoint source pollution due to increased impervious surfaces from higher density development & opportunity to develop floodplains, wetlands, and high groundwater areas

* Cost if flow reduction measures are implemented

SUMMARY OF ALTERNATIVES (Cont'd.)

Alternatives	Description of Alternatives	Total Present Worth ($\$x10^6$)	Pros	Cons
3 (Cont'd.)				3. Construction impacts on surface waters & plant & animal resources 4. Long interceptors causing anaerobic conditions & treatment problems 5. Cost to homeowner from tap-on fees & sewer use fees
4	T.P. Smith/SW plants to serve existing city service area. Growth areas outside service area served by on-site or small community systems	$17.7** (13.2)*	1. Lowest Cost 2. Least impact on groundwater 3. Most implementable 4. Discourages development of marginal lands (floodplains wetlands, high groundwater areas) 5. Reduced energy use 6. Least impact on plant and animal communities due to reduced pipeline construction	1. Decentralized systems potentially more difficult to operate & maintain 2. Small comm. systems with evapor.-perk ponds present potential impact to groundwater 3. May result in higher cost to provide community services due to potentially lower densities in suburban areas using on-lot systems 4. Higher potential for human contact & health effects with on-lot systems under malfunction conditions

* Cost if flow reduction measures are implemented

** Includes modified Southwest conveyance system, J-series interceptors and costs for on-lot systems.

mental impacts increases. These impacts could include degradation of groundwater and surface waters and the potential for human contact and health effects. Managed competently, however, on-site systems and small community systems are effective and environmentally sound. It is recommended that the implementation of Alternative 4 include several measures at the local level which will serve to mitigate potential impacts. The primary recommendations are the following:

1. Revision of basic rules governing septic tank use to allow for systems more suited to current and future demands. These revisions should include siting criteria, basic system design, and the use of alternative systems.

2. The implementation of a management district or other means of on-site systems management to promote efficient operation.

3. Monitoring of groundwater quality in developing areas of Leon County to ensure early detection of contamination of groundwater resources. The focus of this program would be to identify cummulative areawide impacts on groundwater.

DRAFT ENVIRONMENTAL IMPACT STATEMENT

TALLAHASSEE - LEON COUNTY

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CHAPTER I - PURPOSE OF AND NEED FOR ACTION

PART A. PURPOSE OF THE EIS

Concerns within the past decade for preservation of the integrity of the environment led to the adoption of Public Law 91-190, the National Environmental Policy Act (NEPA) of 1969. Within this Act are the national environmental policies and goals intended to mitigate mistakes of the past through careful and coordinated planning efforts. As stated in the law the following declaration was issued: "a national policy shall be established which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological system and natural resources important to the Nation..."

In striving to meet these above stated goals P.L. 91-190 stipulates: "...include in every recommendation a report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment, a detailed statement by the responsible official on the environmental impact of the proposed action; and adverse environmental effects which cannot be avoided should the proposal be implemented; and alternatives to the proposed actions..." From this legislation arises the basic framework for the use of the Environmental Impact Statement (EIS).

The purpose of this particular EIS is to inform the public of potential impacts which may result from the proposed Federal action, and to enable public participation in the decision making process. The EIS is intended to resolve conflicts in the study area between wastewater disposal and the unique natural resources which exist in this area.

The EIS proposes to develop a preferred alternative for wastewater facilities in the study area. This alternative resolves many of those conflicts and will minimize environmental impacts throughout the study area.

PART B. BACKGROUND AND ISSUES

This Environmental Impact Statement is being prepared to address the provision of wastewater management facilities for Leon County, Florida. Leon County is located in northwestern Florida. The only incorporated city within the study area, Tallahassee, serves as both state capital and county seat. The majority of the County's population is concentrated within Tallahassee and its immediate environs. Most new urbanization has occurred north and east of the City. The remaining land area is comprised of natural and planted woodlands and swamps and contains scattered residential development.

In response to rapid growth in Leon County, wastewater facilities planning studies were conducted in 1972 and 1973 to determine how service could be expanded in a cost-effective and environmentally sound manner. These studies identified a need for additional facilities. The costs of these facilities were believed to be too high for the County and City residents to bear alone. As a result, it was decided to apply for federal grants to fund a majority of the facilities costs.

The federal wastewater construction grant program is authorized by Section 201 and Public Law 92-500. It is administered by the U.S. Environmental Protection Agency (EPA). The program requires a three step process: Step 1, a long-range planning study called the 201 Facilities Plan; Step 2, preparation of engineering plans and specifications; and Step 3, construction of facilities.

In late 1974, William M. Bishop Consulting Engineers, Inc., the lead private consultant, began work on the 201 Plan, which in April 1977 was approved by the City and County Commissions. In September 1977, the Florida Department of Environmental Regulation unconditionally certified the 201 Plan to EPA. In February 1978, EPA filed a Negative Declaration on the plan saying it would cause no significant environmental impacts. However, because of opposition from citizens and private organizations, EPA subsequently announced that it would fund for Step 2 only those facilities which will relieve existing adverse water quality problems. An Environmental Impact Statement would be performed on the remaining proposals in the 201 Plan.

The EIS was initiated as a response to a number of issues raised by organizations and individual citizens during the 201 study and during the review period after the Negative Declaration issued by EPA in February 1978. A summary of these issued follows:

1. Land Application Impacts - Concern for public health risks associated with land disposal of treated wastewater on the proposed Southwest Sprayfield Sites was raised. These risks include the transmittal of bacterial or viral diseases by aerosols generated during spraying, possible groundwater contamination, and transmittal of disease from the site by animal vectors. The issue of long-range impacts on vegetation of effluent applied on the sprayfield and its buffer area was also raised by concerned citizens.

2. Wastewater Flow Projections - Citizens claimed that wastewater flow projections in the study area were too high. It was thought that implementation of EPA's policy of encouraging water conservation could reduce wastewater flow substantially. A reduction in wastewater flow projections could affect the staging, siting, and capacity of treatment plants.

3. Development Potential in Northeast Leon County - The 201 and 208 Plans have stated that future residential and commercial growth will take place mainly in northeastern Leon County. Citizens have expressed concern about the impacts of this development adjacent to or upstream of wetlands in this section of the county.

4. Northeast Wastewater Treatment Plant - Homeowners in northeastern Leon County have opposed the location of a sewage treatment plant in their vicinity, declaring it as incompatible with the single family, low-density neighborhoods in the area.

5. Northeast Force Main To Southeast Sprayfield - The alignment of the force main from the proposed Northeast treatment plant to the Southeast Sprayfield determined by the 201 Plan traverses the dam at Lake Lafayette. This has raised questions about construction impacts and problems with operation and maintenance.

6. Future of Lake Bradford Wastewater Treatment Plant - Closing the Lake Bradford plant has been proposed for Phase 1 of the 201 Plan. However, some citizens have suggested renovation of the Lake Bradford Plant as a viable alternative for consideration under Phase 2. It is claimed that such a renovation would have a reduced impact on water and air quality and allow for recapture of investment in the physical facility.

7. Impacts on Vegetation and Wildlife - During the 201 study, several private organizations and individuals have expressed concern about potential impacts on the habitats of threatened and endangered flora and fauna.

PART C. 201 FACILITIES PLAN SUMMARY

The scope of a Step 1-201 study is confined to planning for publicly-owned wastewater collection, treatment, and disposal systems. Other point sources of pollution, such as privately-owned package treatment plants and industrial dischargers operating under National Pollution Discharge Elimination System (NPDES) permits, are noted only if they might one day become part of the municipal system. Likewise, nonpoint pollution has a bearing on the 201 Plan only if stormwater entering the sewers must be eliminated or treated and disposed of by the facilities proposed in the plan. The control of the sources of nonpoint pollution does not fall within the jurisdiction of the 201 Plan but rather is the concern of 208 planning. A 208 Plan has been conducted by the Tallahassee - Leon County Planning Department. Through cooperative agreements between the County and City, those wastewater management issues which would be covered by each study were identified to ensure a thorough investigation and avoid duplication.

As stated previously, the EPA has funded only the first phase of the 201 Plan, those facilities which relieve existing water quality problems. Of these facilities, the following have been completed or are under construction:

- Upgrading of 2.5 mgd Southwest Treatment Plant
- New Southwest Holding Pond and Pumping Station
- New 22.5 mgd Southwest to Southeast Force Main

- New 10.0 mgd Southeast Sprayfield, Holding Pond, and Pump Station

In addition, the following proposed Phase 1 facilities have been EPA - approved and are awaiting construction:

- Expansion of T.P. Smith Plant to 15.0 mgd
- Abandonment of Lake Bradford and Dale Mabry Plants
- Expansion of Southeast Sprayfield to 17.5 mgd
- New 17.5 mgd Sludge Handling Facility
- Additional Interceptors and Pump Stations

Those proposed Phase 2 portions of the 201 Plan which have been covered by this EIS are the following:

- New 5.0 mgd Northeast Plant
- New 60,000 Linear-foot Force Main to Southeast Sprayfield from Northeast Plant
- Expansion of 2,000 acres Southwest Field
- Expansion of T.P. Smith Plant beyond 15.0 mgd
- Additional Interceptors to Growth Areas

CHAPTER II - ALTERNATIVES DEVELOPMENT AND EVALUATION

PART A. INTRODUCTION

The purpose of this chapter is to provide a systematic development of all reasonable alternatives for the attainment of the objectives of this project and to compare these alternatives with the aim of identifying critical differences and selecting a preferred alternative.

Wastewater flow projections are essential to the development of reasonable alternatives. The projections used in the 201 Study were found to be unacceptable to many local citizens. Revised flow projections are presented in this chapter. The effects of flow and waste reduction measures on future flows are also discussed.

Five wastewater management alternatives were developed for this study and they are described in this chapter. The alternatives identified include the construction of new wastewater treatment and conveyance facilities, the upgrading of existing facilities, and the use of on-site and small community treatment facilities. Applicable treatment and disposal methods, including various land application techniques, are also discussed and evaluated.

The evaluation of the wastewater management alternatives is also presented in this chapter. Several factors were used in evaluating and comparing the alternatives including cost effectiveness, environmental feasibility, technical feasibility, and implementability. Mitigative measures for minimizing adverse impacts and enhancement measures for emphasizing beneficial impacts are identified.

PART B. WASTEWATER FLOW PROJECTIONS

Wastewater flow projections are a key issue in any wastewater management study because they affect the staging, siting, and capacity of facilities. Many citizens of the Tallahassee-Leon County EIS study area felt that the flow projections used by the 201 Consultants were too high. In addition, it was thought that the EPA's policy of encouraging water conservation could reduce wastewater flows substantially.

1. FLOW PROJECTIONS ANALYSIS

The EIS wastewater flow projections were initially presented in the Alternatives Development Task Report. These flow projections provided a detailed breakdown of water consumption and wastewater generation by census tract. The projections received varying degrees of criticism for not taking into account the changes in residential, commercial and institutional units that occur in a growing community. Also, changes in

City/County agreements concerning water and sewer servicing to certain areas in Leon County have taken place since the first projections were developed. The wastewater flow projections were therefore revised in the Alternatives Evaluation Task to incorporate these considerations.

Briefly, the determination of wastewater flow projections was a two step process:

1. Estimation of present and future wastewater service populations.
2. Calculation of projected wastewater flows based on service populations and per capita flows.

Numerous sources were consulted to obtain the needed information: the City of Tallahassee Underground Utility Department and Water Quality Laboratory supplied flow data and a detailed sewer line atlas; the Tallahassee Water Study provided water consumption data; and the Tallahassee - Leon County Planning Department furnished population information. Chapter Two, Volume II, of the Alternatives Evaluation Task Report contains a detailed description of the methodology utilized in projecting wastewater flows.

The results of the revised flow projections for the study area are summarized in Table II.1. Total wastewater flow projected for the area at the end of the planning period is 22.3 mgd. The flow projection estimates do not include flows that will be generated in the Talquin Electric Cooperative (T.E.C.) or Falls Chase Special Taxing District service areas. These non-municipal sewer authorities have received approval by the State of Florida and Leon County to provide wastewater service in the area. These areas are delineated on Figure II.1.

2. FLOW AND WASTE REDUCTION MEASURES

Flow and waste reduction measures refer primarily to water conservation techniques and to measures which can reduce the creation of waste materials. Water conservation can reduce energy use, and it can reduce costs for water and wastewater systems. The evaluation of flow and waste reduction measures took into account the advantages and disadvantages of various flow reduction measures, the experiences of other cities across the country in employing these measures, and efforts within Leon County to reduce flows.

Table II.2 shows the list of assumptions used in estimating the potential for wastewater flow reduction in the study area. The effects of these flow reduction measures on wastewater flow projections were estimated by considering that per capita reductions in wastewater flows at new and renovated homes and industries are estimated at 20 gpcd for residents and 7 gpcd for commercial/institutional employees based on assumptions listed in Table II.2. Flow projections for Leon County without and with the simulated water-saving fixtures are shown on Table II.1. The effect of water-saving fixtures at new and renovated residences and commercial/institutional establishments is to reduce projected year 2000

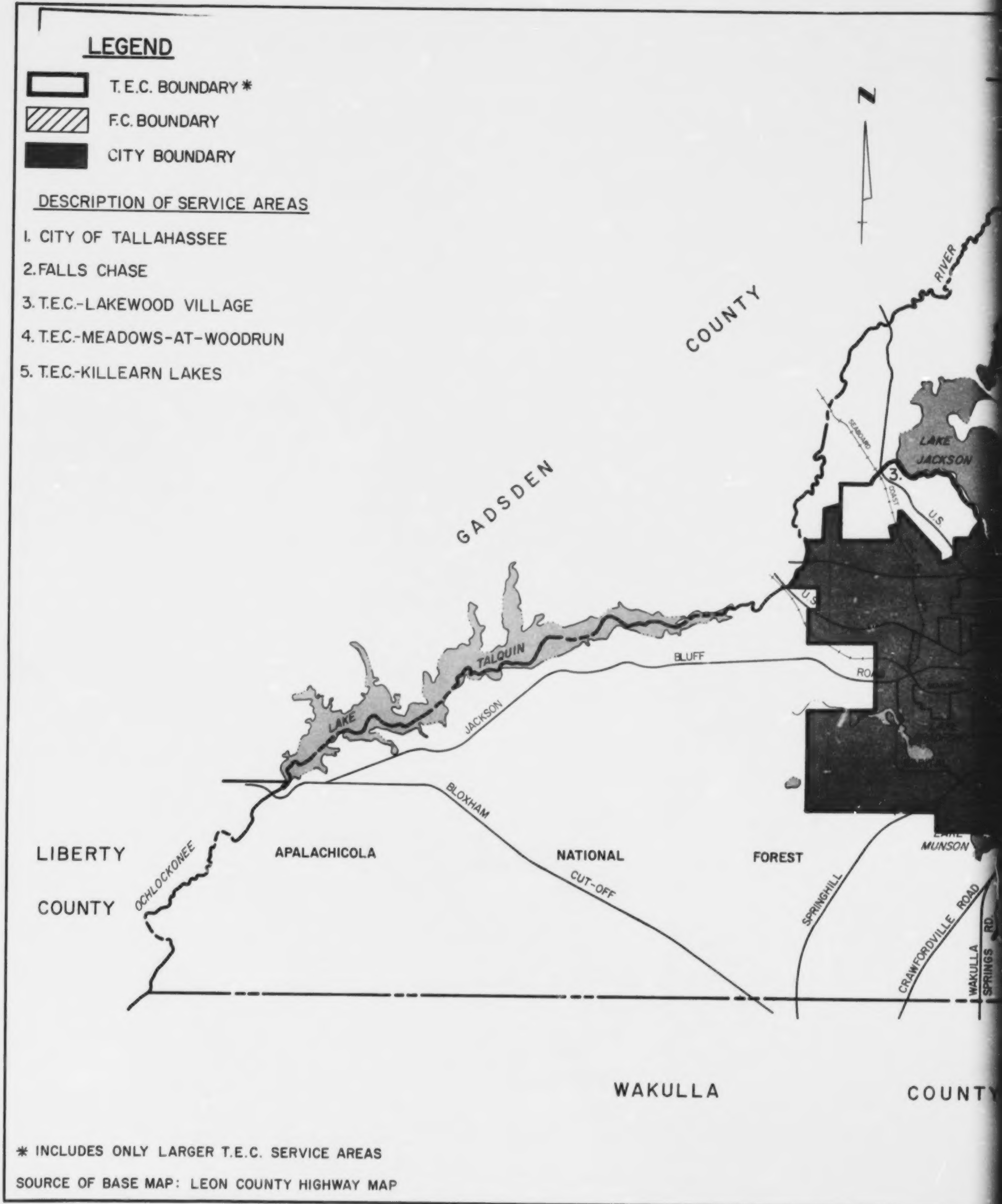
TABLE II.1
SUMMARY OF AVERAGE WASTEWATER FLOW PROJECTIONS BY SERVICE AREA

	1980 Flows		1990 Flows		2000 Flows	
Service Area	With Flow Red. Meas. (mgd)	Without Flow Red. Meas. (mgd)	With Flow Red. Meas. (mgd)	Without Flow Red. Meas. (mgd)	With Flow Red. Meas. (mgd)	Without Flow Red. Meas. (mgd)
Southwest[1]	11.6	11.6	14.4	15.6	17.1	18.9
Northeast[2]	0.5	0.5	1.0	1.1	1.8	2.1
Southeast[3]	0.3	0.3	0.7	0.8	1.0	1.3
Total	12.4	12.4	16.1	17.5	19.9	22.3

[1] Southwest Service Area includes flow generated by the sewered populations residing in census tracts 1-21, plus 60% of 22, and 25% of 24.

[2] Southeast Service Area: Includes 95% of flows generated by census tract 25 sewered population

[3] Northeast Service Area: Includes census tracts: 75% of 24, and 5% of 25


N
GADSDEN
COUNTY
RIVER
SEABOARD
COAST
LAKE JACKSON
3.
U.S.
U.S.
LAKE TALQUIN
BLUFF
ROA
JACKSON
BLOXHAM
CUT-OFF
LIBERTY
COUNTY
OCHLOCKONEE
APALACHICOLA
NATIONAL
FOREST
LAKE MUNSON
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
WAKULLA
COUNTY

LEGEND

▭ T.E.C. BOUNDARY *

▨ F.C. BOUNDARY

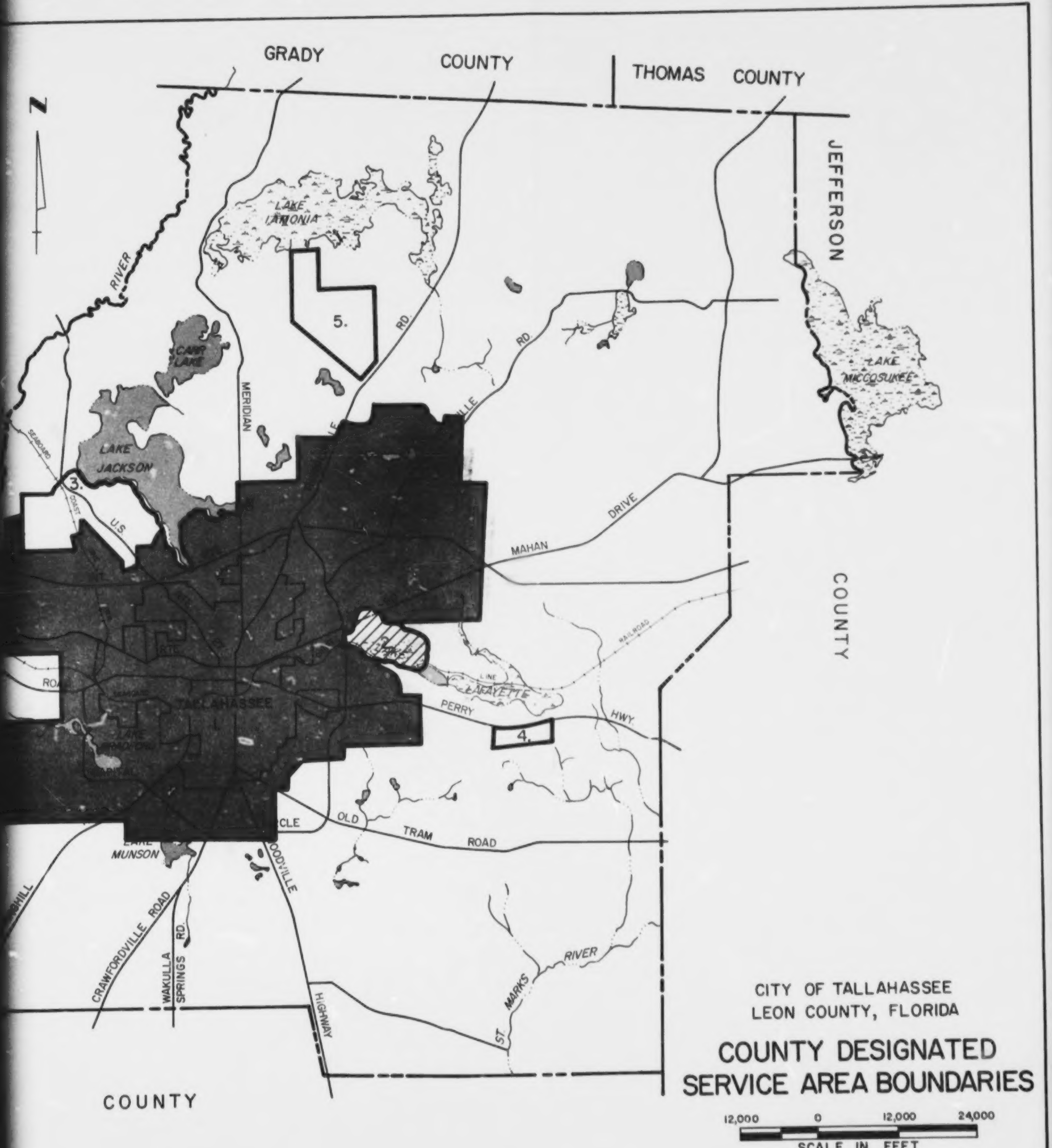
■ CITY BOUNDARY

DESCRIPTION OF SERVICE AREAS

1. CITY OF TALLAHASSEE
2. FALLS CHASE
3. T.E.C.-LAKEWOOD VILLAGE
4. T.E.C.-MEADOWS-AT-WOODRUN
5. T.E.C.-KILLEARN LAKES

* INCLUDES ONLY LARGER T.E.C. SERVICE AREAS

SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP



GRADY COUNTY
THOMAS COUNTY
JEFFERSON COUNTY
N
RIVER
LAKE IAMONIA
5.
RD.
RD.
CARR LAKE
MERIDIAN
LAKE JACKSON
SEABOARD
COAST
3.
U.S.
LAKE MICCOSUKEE
MAHAN
DRIVE
RAILROAD
LINE
LAKE LAFAYETTE
PERRY
HWY.
4.
TALLAHASSEE
LAKE BRADFORD
OLD TRAM ROAD
LAKE MUNSON
WOODVILLE HIGHWAY
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
ST. MARKS RIVER
COUNTY
12,000 0 12,000 24,000
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

COUNTY DESIGNATED SERVICE AREA BOUNDARIES

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE II.1

TABLE II.2
ASSUMPTIONS FOR ESTIMATING POTENTIAL FOR FLOW REDUCTIONS

1. Water-saving devices will be required only for residences and establishments built or renovated beginning in 1980.

2. No devices will be installed at faucets.

3. Conventional residential toilets use 5 gallons per flush; conventional commercial/institutional toilets use 4.5 gal/flush. Water-saving toilets will use 3.5 gallons per flush or 30 percent less water than conventional residential toilets.

4. Conventional shower heads emit 6 gallons per minute; water-saving shower heads emit 3.5 gallons per minute or 42 percent less water than conventional shower heads.

5. Each resident flushes a toilet 5 times per day. Each employee/institutional resident flushes a toilet 3 times per day.

6. Each resident and 30 percent of the employee/insitutional population takes a five-minute shower each day. Time to take a shower is assumed to be the same with and without water-saving shower heads.

7. 15 percent of existing residences will be renovated between 1980 and 2000 requiring the installation of water-saving toilets and shower heads. This assumption is based on an average age of a home of 50 years and that 15 percent of existing homes will be 50 years of age by the year 2000.

average flows to treatment plants from 22.3 to 19.9 million gallons per day (mgd).

Such a water conservation program would not be difficult to implement nor would it require significant sacrifices by people in new or renovated structures. Water-saving toilets and shower heads have been used without complaints or public health concerns in other areas. Operation and maintenance of fixtures would not be costly or frequent.

The use of these water-saving devices will, however, reduce water and sewer revenues. These reductions are estimated in Table II.3. Other adverse impacts include initial costs and increased concentrations of wastewater constituents reaching a wastewater treatment plant.

Benefits which would be obtained from 2.4 mgd of lower flow in the year 2000 are the following:

- Less need for expansion of wastewater collection, treatment and disposal systems.
- Less need for expansion of water supply wells, treatment, distribution and storage systems.
- Lower operation, maintenance and energy costs for wastewater and water supply systems.
- Reduced size of geographical area which is impacted by disposed wastewaters.
- Groundwater sources are better conserved for future use.
- Improved chances for proper operation of on-site wastewater treatment and disposal systems.
- Lower sewer, water and energy costs for each water-conserving residence and establishment.
- National water conservation goals are supported by responsible action.

PART C. IDENTIFICATION AND DEVELOPMENT OF WASTEWATER MANAGEMENT

ALTERNATIVES

The development of alternatives for wastewater treatment in Leon County was accomplished in two phases. The first consisted of developing alternative wastewater service area configurations. A service area configuration is a distinct plan for providing wastewater treatment and disposal services to each designated service area either by local treatment/disposal or by regional treatment/disposal by two or more ser-

TABLE II.3
PROJECTED EFFECT OF WATER CONSERVATION ON SEWER AND WATER REVENUES IN THE YEAR 2000

Service Area	Wastewater Flow Reduction (1000 gal/day)		Water Use Conserved (1000 gal/day)		Monthly Receipts Lost @ $1.00/1000 gal (sewer) and $0.39/1000 gal (water)		
	Residences	C/I*Estab.	Residences	C/I Estab.	Residences	C/I Estab.	Total
Southeast Service Area	235	19	276	20	$7,140	$ 580	$ 7,720 (Sewer
					3,270	240	3,510 (Water
							$ 11,230
Northeast Service Area	259	12	305	13	7,870	360	$ 8,230 (Sewer
					3,620	150	3,770 (Water
							$ 12,000
Southwest Service Area	1,435	316	1,688	321	43,620	9,610	$ 53,230 (Sewer
					20,010	3,810	23,820 (Water
							$ 77,050
					Total Monthly Receipts Lost		$ 69,180 (Sewer
							31,100 (Water
							$100,280

Assumptions:

1) For residences, wastewater generation accounts for 85 percent of water consumed.
2) For commercial and institutional establishments, wastewater generation accounts for 95 percent of water consumed.
3) Extent of water service area is the same as the extent of sewer service area.
4) Monthly fixed fees based on meter size will not change as a result of implementing water conservation measures.

* C/I - Commercial/Institutional

vice areas. It does not include options for actual treatment and disposal methods but rather delineates locations and flows.

The second phase of alternatives development involved screening available wastewater treatment/disposal techniques for applicability within Leon County. This generated a list of options for wastewater treatment, effluent disposal, and sludge disposal for each of the service area configurations.

The result of the alternatives development process was a few wastewater management alternatives each with several possible treatment/disposal combinations. In order to quantify costs, environmental impacts and other evaluation factors for comparison of alternatives, it was necessary to go one step further. The first step of the evaluation process, therefore, was to select preferred treatment/disposal options for each wastewater management alternative.

The following sections provide an overview of the alternatives development process from the initial designation of service area configurations to the determination of the final wastewater management alternatives through the selection of preferred treatment/disposal options.

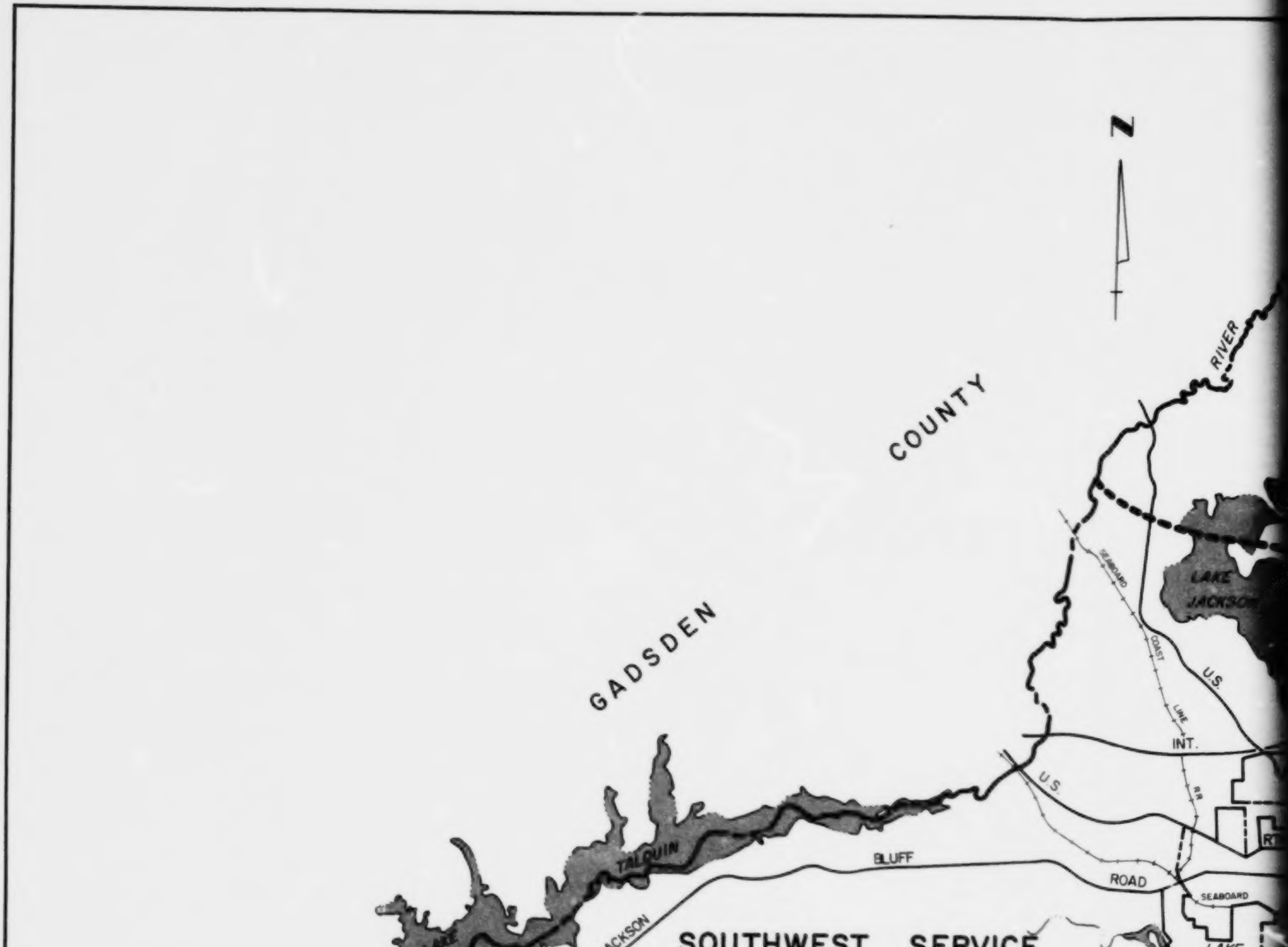
1. ALTERNATIVE WASTEWATER SERVICE CONFIGURATIONS

For purposes of alternative development and evaluation Leon County has been divided into three potential service areas, as illustrated in Figure II.2. The Draft Alternatives Development Task Report of the EIS Study determined that five configurations of these service areas were feasible alternatives and should be further evaluated in addition to the No-Federal-Action Alternative. One alternative addressed further use of the Lake Bradford Plant. This was dropped from further evaluation because it was felt that the relief sewer line from the Northeast to the Lake Bradford Plant that would have been necessary for this configuration would have caused existing capacity in the collection system to go unused. Instead, the use of the Lake Bradford Plant was investigated independently for use under each of the other alternatives.

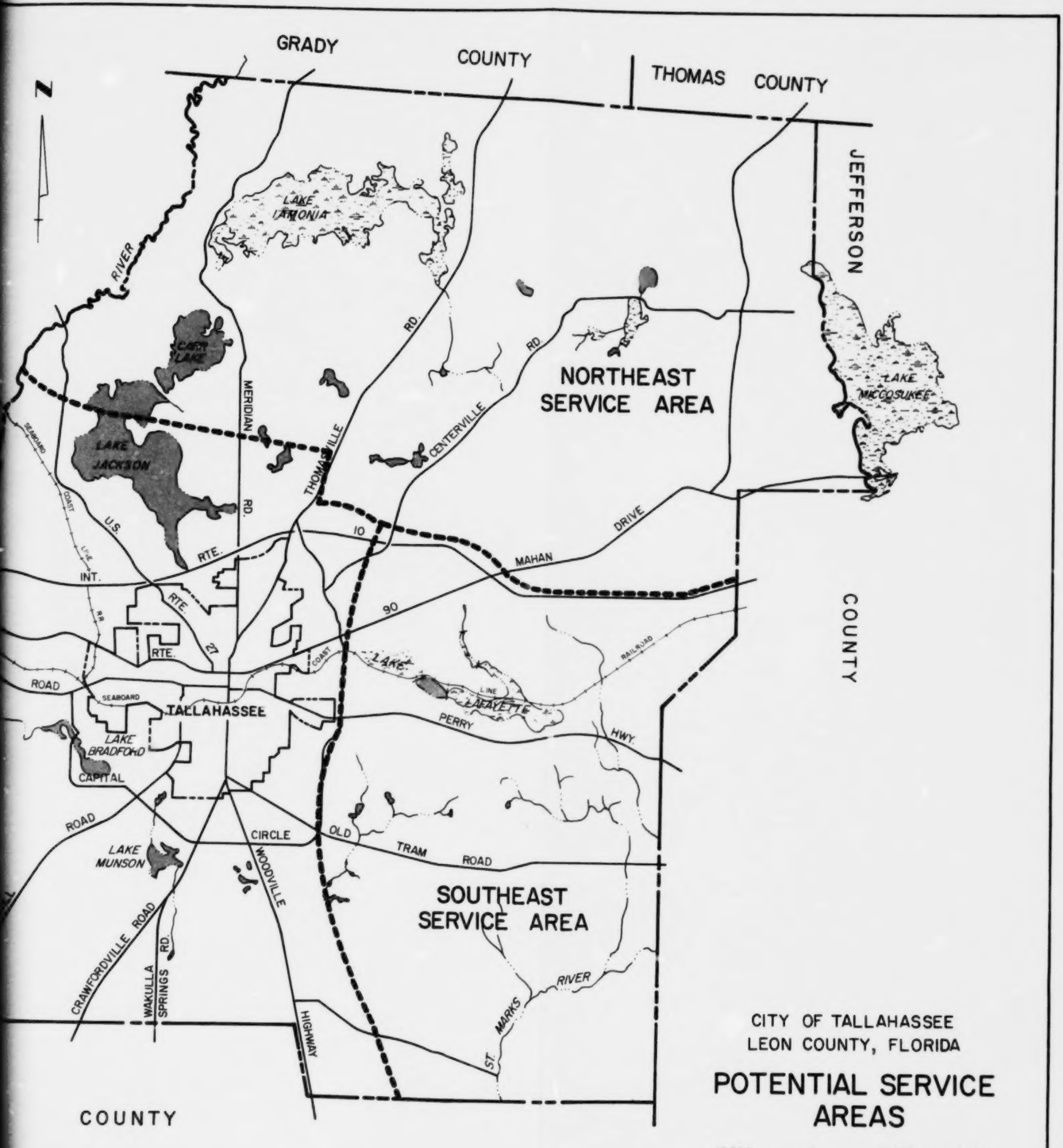
Table II.4 contains a description of the evaluated alternatives.

2. IDENTIFICATION OF APPLICABLE TREATMENT SYSTEMS

Specific treatment processes and levels of treatment are dependent upon the method of disposal and treatment criteria set by State and Federal agencies. For municipal wastewater, the Florida Department of Environmental Regulation requires a minimum secondary level of treatment equaling 90 percent or better removal of BOD and suspended solids. Therefore, any treatment technology used must be compatible with the State's minimum requirements as well as any additional limitations based on the disposal technique selected.


N
RIVER
GADSDEN COUNTY
LAKE JACKSON
SEABOARD COAST LINE RR
U.S.
INT.
U.S.
RT
LAKE TALQUIN
BLUFF ROAD
SEABOARD
JACKSON
SOUTHWEST SERVICE AREA
LAKE BRADFORD
CAPITAL
ROAD
LAKE MUNSON
BLOXHAM CUT-OFF
LIBERTY COUNTY
OCHLOCKONEE
APALACHICOLA NATIONAL FOREST
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA
WAKULLA COUNT

SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP


GRADY
COUNTY
THOMAS COUNTY
JEFFERSON
COUNTY
COUNTY
N
RIVER
LAKE IAMONIA
CARR LAKE
LAKE JACKSON
LAKE MICCOSUKEE
NORTHEAST SERVICE AREA
SOUTHEAST SERVICE AREA
MERIDIAN RD.
THOMASVILLE RD.
CENTERVILLE RD.
SEABOARD COAST LINE RR
U.S. RTE. 27
INT. RTE. 10
MAHAN DRIVE
RTE. 90
SEABOARD COAST LINE RAILROAD
LAKE LAFAYETTE
PERRY HWY.
ROAD
TALLAHASSEE
LAKE BRADFORD
CAPITAL CIRCLE ROAD
OLD TRAM ROAD
LAKE MUNSON
WOODVILLE HIGHWAY
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
ST. MARKS RIVER
12,000
0
12,000
24,000
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

POTENTIAL SERVICE AREAS

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE II.2

TABLE II.4
DESCRIPTION OF EVALUATED ALTERNATIVE SYSTEMS

ALTERNATIVE	DESCRIPTION
No. 1A	Southwest and Southeast service area flows to T.P. Smith/Southwest plants and possibly to Lake Bradford Plant if needed and Northeast service area flows to proposed Northeast plant. Effluent from T.P. Smith/Southwest plant is disposed of at Southeast Sprayfield; Northeast plant effluent disposed of in Northeast.
No. 1B	Same as 1A, except Northeast plant effluent is disposed of at Southeast Sprayfield.
No. 2	All service area flows to T.P. Smith/Southwest plants and possibly to Lake Bradford Plant, if needed. Effluent disposal at Southeast Sprayfield.
No. 3	Southwest service area flows to T.P. Smith/Southwest plants and possibly to Lake Bradford Plant, if needed. Southeast and Northeast service area flows to proposed Southeast plant. Effluent from both plants disposed of at Southeast Sprayfield.
No. 4 also (No-Federal Action Alternative)	Flows generated within City of Tallahassee's existing Service Area Boundaries to the T.P. Smith/Southwest Plants and possibly Lake Bradford plant, if needed, and growth areas outside boundaries served by individual or small community systems.

The alternatives for municipal wastewater treatment fall into three general categories:

1. Primary Treatment
2. Secondary Treatment
3. Advanced Wastewater Treatment

The major objective of primary treatment is to remove settleable and floatable materials from wastewater. Primary treatment will typically remove 60 percent of the suspended solids and 35 percent of the BOD. These levels of efficiency do not satisfy government standards for disposal in the study area. However, primary treatment is normally the first step of secondary treatment processes and is considered technologically feasible in combination with all secondary treatment systems.

The primary goal of secondary treatment is to remove soluble BOD that escapes the primary process and to provide added removal of suspended solids. These removals are typically achieved by using biological processes which bring microorganisms in contact with organic pollutants under favorable environmental conditions. A variety of approaches have been used to meet these basic needs. The most common methods are:

1. Activated Sludge
2. Rotating Biological Contactors
3. Trickling Filters
4. Oxidation Ponds

These processes do not remove substantial amounts of nitrogen, phosphorous, COD, or heavy metals, nor do they completely remove pathogenic bacteria and viruses. These pollutants require advanced wastewater treatment for removal especially where disposal techniques may impact sensitive environmental systems.

The purpose of advanced wastewater treatment is to remove the nitrogen, phosphorous, soluble COD, and heavy metals that are left behind by secondary processes. Advanced wastewater treatment removal efficiencies are normally achieved by combining secondary treatment processes with a unit process that affects a specific pollutant. These processes are generally 1) biological-chemical, 2) physical-chemical, or 3) a combination of 1 and 2.

Table II.5 lists basic primary, secondary, and AWT treatment processes that could be used in the study area.

3. IDENTIFICATION OF APPLICABLE DISPOSAL SYSTEMS

Disposal of treated wastewater effluent is a key aspect in any wastewater management system, especially in this study area where conven-

TABLE II-3

FEASIBLE TREATMENT PROCESSES WITH
SUMMARY OF KEY CHARACTERISTICS

Treatment Processes	Pollutant Removals				Costs $/1000 Gal.	Energy Req't kwh/MGD	Space Req't Acres/MGD	Advantages	Disadvantages
	% BOD_5	% SS	% N	% P					
Primary Treatment	25-40	50-65	5-10	5-10	0.15-0.25	100	0.1	**	**
Secondary Treatment									
Activated Sludge	90	90	10	10	0.25-0.75	675	0.5	Versatile, high removal and cost-effective	Close operation control; high energy needs
Rotating Biological Contactor Process	90	90	10	10	*	400	0.5	Ease of operability; high removal; versatile	Temperature affected, Inexperience with process
Advanced Wastewater Treatment (AWT)									
Phosphorus Removal	98	98	35-65	90-95	*	Minimal	Minimal	Reliable removals; ease of control; versatile	Increase in sludge; additional chemical costs
Nitrogen Removal -Nitrification-Denitrification	-	-	80-90	-	0.22-0.40	625	0.3-0.6	Reliable removals, no added chemicals	Additional space needed, subject to upsets
-Ammonia Stripping	-	-	85-98	-	0.08-0.12	1,000	0.1	Low cost nitrogen removal; ease of use and less space	Temperature effected; build-up of deposits;
Other AWT Processes -Filtration	95-99	97-99	-	90-95	0.09-0.15	100	0.1	High solids removal; proven process, readily automated	Backwash waste
-Carbon Adsorption	99	99	92	99	0.15-0.48	500	0.1	Tolerant process; space efficient; regeneration of carbon	High cost of carbon; use mainly on large-scale plants
Land Application	98	98	85	98	0.19-1.50	1,000-2,500	100-600	High pollutant removal; recycle of resources; preservation of open space	Large land requirements; possible groundwater pollution and public h health concern

* Costs difficult to generalize

** Required as part of secondary treatment tional surface discharge to flowing rivers is unavailable. There are three general disposal methods that may be available in the study area. These include:

1. Surface water discharge (small or intermittent streams)
2. Deep-well injection
3. Land application (slow rate, rapid infiltration, wetland discharge, subsurface disposal)

Surface Water Discharge

Florida DER has taken several actions that will, in effect, eliminate all future surface water discharges in the Tallahassee-Leon County study area. Effluent discharge limitations and the classification of the Ochlockonee and St. Marks river as Special Waters effectively imposes a zero discharge situation. The limited assimilative capacities of lakes and streams in the area, due to low flows and water levels during dry periods, further limits the use of surface water for disposal. In addition, the recreational significance of area lakes, in conjunction with the fact that most streams discharge into these lakes, eliminates these water bodies as disposal sites.

Deep-Well Injection

Deep-well injection as a feasible disposal alternative was rejected by the Tallahassee-Leon County Wastewater Facilities Plan (201 Plan) for several reasons: 1) poor geologically conditions, 2) no testing or prior experience with deep-well injection in the study area, 3) the potential risk of freshwater aquifer pollution, and 4) the long-term impacts of injected wastewater are unknown.

Land Application

Land application of treated wastewater for the purpose of land disposal is site-dependent. Factors which must be considered include the availability of land, soil structure and chemistry, topography, geology, hydrology, climate, and vegetation. Land-treated wastewater is ultimately disposed of by evapotranspiration, evaporation, or percolation to the groundwater.

There are four land application methods that are considered to have potential for use in the study area. These are:

1. The slow rate process

2. The rapid infiltration process

3. Wetland discharge

4. Soil absorption system (on-site or small community)

The following paragraphs describe these four land application disposal methods and suitable locations for their use. Tables II.6 and II.7 provide comparisons of site characteristics and design criteria for the various types of land application considered.

Slow Rate Process: The term slow rate land treatment is used to focus attention on wastewater renovation as well as wastewater disposal. Wastewater renovation and disposal is accomplished through natural soil processes such as filtration, percolation to groundwater, absorption, adsorption, chemical precipitation, biological oxidation, and nutrient uptake by plants. Slow rate application is generally accomplished by sprinklers or surface flooding such as ridge-and-furrow and border strip flooding.

The slow rate process generally produces the best results of all land treatment systems. Organic materials, suspended solids, and nutrients show high removal levels in well functioning systems. Table II.8 compares typical removal efficiencies of slow rate processes with other land application systems.

Soil conditions within the study area generally appear to be adequate for using slow rate land application. Soil associations in Leon County indicate soil permeabilities are rated moderately to rapidly permeable, characteristics favorable to slow rate land application.

Rapid Infiltration Process: Unlike the slow rate process, disposal of wastewater is the primary focus of rapid infiltration rather than wastewater treatment. In rapid infiltration systems, most of the applied wastewater percolates through the soil and recharges the groundwater table which allows for water reuse and streamflow augmentation. When groundwater is at less than acceptable depth, drains or wells are used to collect and reapply or discharge the wastewater.

Figure II.3 shows unsuitable sites for both rapid infiltration and slow rate land application. Most sites are unsuitable due to expected land use rather than natural conditions.

Highly permeable soils are required to accept wastewater at application rates consistent with rapid infiltration practices. Soil conditions within the study area are generally favorable for proper application and renovation of treated effluent. Permeabilities of rapid to moderately rapid are found in significant quantities throughout most of the study area and in all areas where disposal of wastewater may be needed.

State regulations require advanced wastewater treated effluent for rapid infiltration disposal when sensitive ground water resources are involved. Because parts of the Tallahassee-Leon County study area are considered recharge areas for the Floridan Aquifer, advanced wastewater treatment may be required for wastewater disposal by rapid infiltration methods. Table II.8 shows the expected wastewater quality from rapid

TABLE II.6

COMPARISON OF SITE CHARACTERISTICS
FOR LAND TREATMENT PROCESSES

Characteristics	Slow Rate	Rapid Infiltration	Wetlands	Subsurface
Slope	Less than 20% on cultivated land; less than 40% on noncultivated land	Not critical; excessive slopes require much earthwork	Usually less than 5%	Not critical
Soil permeability	Moderately slow to moderately rapid	Rapid (sands, loamy sands)	Slow to moderate	Slow to rapid
Depth to groundwater	2 to 3 ft. (minimum)	10 ft. (lesser depths are acceptable where underdrainage is provided)	Not critical	Not critical
Climatic restrictions	Storage often needed for cold weather and precipitation	None (possibly modify operation in cold weather)	Storage may be needed for cold weather	None

---

1 ft. = 0.305 m.

Source: Process Design Manual for Land Treatment of Municipal Wastewater, U.S. Environmental Protection Agency (October 1977).

TABLE II.7
COMPARISON OF DESIGN FEATURES FOR LAND TREATMENT PROCESSES

Feature	Slow Rate	Rapid Infiltration	Wetlands	Subsurface
Application techniques	Sprinkler or surface[a]	Usually surface	Sprinkler or surface	Subsurface piping
Annual application rate, ft.	2 to 20	20 to 560	4 to 100	8 to 87
Field area required, acres[b]	56 to 560	2 to 56	11 to 280	13 to 140
Typical weekly application rate, in.	0.5 to 4	4 to 120	1 to 25	2 to 20
Minimum preapplication treatment provided in the United States	Primary sedimentation[e]	Primary sedimentation	Primary sedimentation	Primary sedimentation
Disposition of applied wastewater	Evapotranspiration and percolation	Mainly percolation	Evapotranspiration, percolation, and runoff	Percolation with some evapotranspiration
Need for vegetation	Required	Optional	Required	Optional

---

a. Includes ridge-and-furrow and border strip.
b. Field area in acres not including buffer area, roads, or ditches for 1 Mgal/d (43.8 L/s) flow.
c. Range for application of screened wastewater.
d. Range for application of lagoon and secondary effluent.
e. Depends on the use of the effluent and the type of crop.

1 in. = 2.54 cm.
1 ft. = 0.305 m.
1 acre = 0.405 ha.

Source: Process Design Manual for Land Treatment of Municipal Wastewater, U.S. Environmental Protection Agency (October 1977).

TABLE II.8

TYPICAL QUALITY OF TREATED WATER FOLLOWING LAND TREATMENT PROCESSES

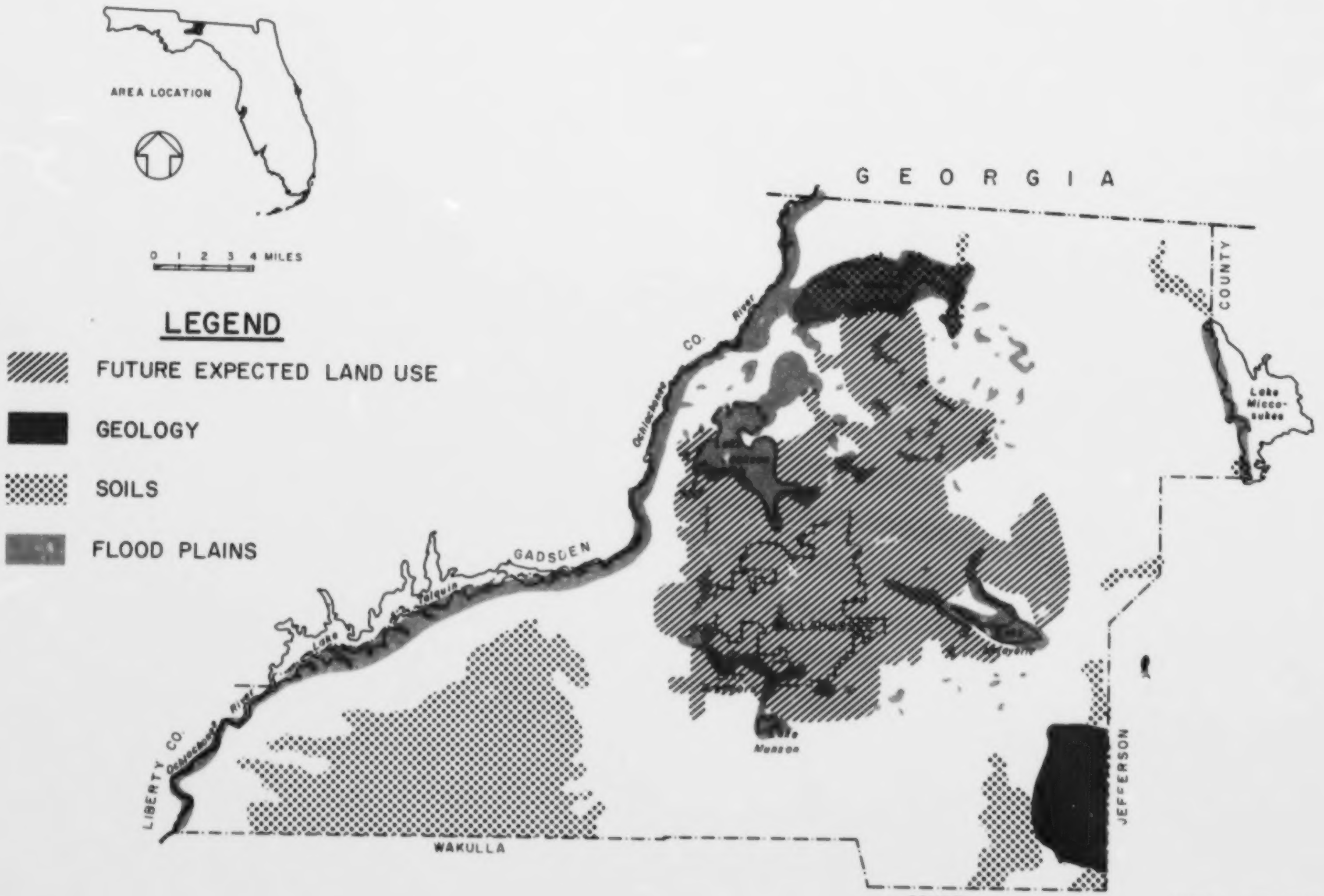
Constituent	Slow Rate[a.]	Rapid Infiltration[b.]	Wetlands[c.]	Subsurface[d.]
BOD	<2	2	7	9
Suspended Solids	<1	2	6	6
Total Nitrogen as N	3	10	1.1	24.5
Total Phosphorus as P	<0.1	1	3.8	9.0

a. Percolation of primary or secondary effluent through 5 ft. (1.5 m) of soil

b. Percolation of primary or secondary effluent through 15 ft. (4.5 m) of soil

c. Treatment of secondary effluent in lagoons planted with water hyacinths

d. Loading rate average of 5 gal/d/ft^2 through septic tanks sand filter system


AREA LOCATION
0 1 2 3 4 MILES
LEGEND
FUTURE EXPECTED LAND USE
GEOLOGY
SOILS
FLOOD PLAINS
GEORGIA
COUNTY
Lake Miccosukee
JEFFERSON
COUNTY
WAKULLA
LIBERTY CO.
Ochlockonee River
Lake Talquin
GADSDEN
CO.
Ochlockonee River
Lake Munson

SOURCE OF BASE MAP: State of Florida,
Department of Transportation

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

SITES UNSUITABLE FOR LAND APPLICATION

FIGURE II.3

infiltration systems and compares them with other disposal methods being considered.

Wetland Discharge: The term wetlands is a broad classification covering areas known as marshes, bogs, wet meadows, peatlands, and swamps. They generally consist of low-lying, usually level saturated land, partially or intermittently covered with standing water. In wetland discharge systems, wastewater is renovated by the soil, plants, and microorganisms as it moves through the soil profile. However, renovation action is usually more dependent on microbial and plant activity than soil processes.

Three categories of wetlands are normally used for municipal wastewater treatment: 1) artifical wetlands - lagoons with aquatic plants such as water hyacinths, 2) existing wetlands - areas with standing water such as swamps and cypress domes, and 3) peatlands or bogs - high organic content of the soil provides good pollutant removal. Because the study area has large wetland areas, natural existing wetlands present the most feasible wetland disposal option. Table II.8 shows the expected wastewater quality from wetland discharge systems and compares the quality with other land application methods.

Wetland discharge was eliminated as a viable disposal option in the Tallahassee-Leon County study area. This action was taken in part due to the fact that wetland discharges are only being permitted in Florida for small communities on an experimental basis at this time. Information on wetland discharge has been developed from relatively small systems and extrapolation of this information to large systems would be questionable. Furthermore, no single wetland area in the study area would be large enough to accommodate all the possible flows anticipated. This would create a situation where many small areas would need to be used, increasing the disposal cost considerably.

Soil Absorption System: Conventional soil absorption systems are viable wastewater disposal as well as wastewater treatment alternatives in areas with favorable soil, geologic, climatic, and hydrologic conditions. Soil absorption systems are most often appropriate when the following conditions exist:

1. Suitable soil permeability
2. Sufficient depth to bedrock or fragipan
3. Sufficient depth to seasonal high water table
4. Relatively flat land

Where these conditions do not exist, certain limitations can be overcome with site modifications such as grading and filling or system modifications such as sand filters or elevated sand mounds.

Generally, soil absorption systems are used in conjunction with septic tanks in individual on-site systems. However, in sections of small communities where population density or site conditions limit individual on-site system use, community-sized systems may be feasible at adjacent locations where conditions are satisfactory. For example, effluent from individual septic tanks can be conveyed to a central soil absorption system located where the soil, geologic, and hydrologic conditions are most favorable. Soil absorption disposal is also feasible with other forms of treatment systems on an individual or small community basis.

The northeast and southeast sections of the study area are generally suitable for continued and future use of soil absorption systems for wastewater disposal. Soil associations are generally adequate and population densities, for the most part, are low enough for individual on-site disposal systems. In those areas where on-site systems cannot be used, community systems with soil absorption disposal may be appropriate. The southwest, where less population growth is expected, is also generally suitable for soil absorption disposal systems. The soil and population densities are satisfactory for these systems. Areas suitable for on-site systems are delineated on Figure IV.10.

4. IDENTIFICATION OF WASTEWATER COLLECTION SYSTEM ALTERNATIVES

Generally, the most cost effective wastewater collection and conveyance systems are gravity sewers. Gravity sewers transport wastewater and solids from homes by gravity to central collection facilities for treatment or pumping to high elevations. The size and slope of gravity sewers are based on the design hydraulic load at velocities sufficient to prevent deposition of solids. For this reason, deep excavation resulting in high construction cost, especially in areas with shallow bedrock, are required in locations where the natural slope is inadequate to maintain sufficiently high velocities.

When the cost of constructing gravity conveyance sewers becomes excessively expensive, force mains are often substituted. Because force mains use pumps not gravity for move the wastewater, they can be installed at minimum depths and conform to land contours. This eliminates the need for deep excavation and manholes. However, force mains require higher operation and maintenance expenditures as well as pump station construction.

Recently, the use of alternative wastewater collection systems has become popular due to the development of new technology which makes these systems dependable and cost effective. These systems are particularly cost effective where low density development and rock excavation makes conventional gravity collection costly.

The alternative systems most commonly used are 1) the pressure sewer, and 2) the vacuum sewer. There are two types of pressure systems available. The most common uses a grinder pump to transport wastes through low pressure PVC (polyvinyl chloride) force mains. The second most common system involves removing waste solids from the wastewater with a septic tank and then pumping the effluent wastewater with a wastewater sump pump to treatment. Vacuum sewers rely on the vacuum in collection lines to transport wastewater to treatment.

In the unsewered portions of the Tallahassee-Leon County study area, the terrain is irregular with many small drainage areas due to karst sinks. In addition, many of these areas have shallow bedrock which hinders excavation. Pressure and vacuum sewers can eliminate the need for deep excavation and manholes, thus lowering sewer construction cost in these areas.

Since there are too few operating vacuum sewer systems to consider this a proven technology, only pressure sewers are considered feasible in the study area. These systems are also only considered feasible in the unsewered areas surrounding the City of Tallahassee due to the existence of conventional collection systems within the existing system. A further discussion of gravity and pressure collection systems as they relate to small community systems can be found in the following section.

5. IDENTIFICATION OF ALTERNATIVES TO CENTRALIZED COLLECTION AND TREATMENT

Until recently, wastewater facility and water quality management planners generally recommended that on-site systems be replaced by conventional systems wherever feasible. On-site systems were perceived as temporary solutions and were thought to provide inadequate treatment and disposal over the long run. However, amendments to the Clean Water Act of 1977 and the high cost of providing centralized wastewater systems have led water quality management planners to re-evaluate on-site and small community systems.

On-site and small community systems for wastewater collection, treatment and disposal can be the most effective, environmentally sound and implementable alternatives for areas in Leon County not connected to the municipal sewer system. The feasibility of alternatives to centralized collection and treatment systems of depend upon the following:

1. Total cost
2. Operability, reliability, and implementability
3. Environmental impacts
4. Land use and development impacts
5. Management and institutional arrangements necessary for effective implementation

The wastewater needs of the population outside the Tallahassee-Leon County sewer service area have been met with individual on-site septic systems and private package treatment systems. On-site septic systems are primarily used by individual homeowners, while package treatment systems are used where larger flows are generated, such as schools, businesses, and mobile home parks. These systems have been used with varying effectiveness.

On-Site Septic Systems

A septic tank is included as part of almost all individual, on-site systems. Other on-site systems such as sand filters and extended aeration systems have also been used. However, these latter units are more expensive and are normally used when additional treatment is required. Once a septic tank is in place, maintenance is only needed to pump septage every four to eight years and to inspect the system. A 50 percent treatment efficiency can be expected in terms of removal of five-day BOD from use of the septic tank alone.

A soil absorption field is the method of disposal most often utilized at individual homes, businesses, or institutions because of costs and maintenance requirements of other systems. Additional wastewater treatment takes place as it percolates through the soil. Septic tank/absorption field systems can operate effectively with limited maintenance as long as soil conditions, land slopes and land use are suitable.

To overcome less than ideal conditions, various processes have been developed that enhance the treatment and disposal capabilities of on-site systems. Sand mound disposal systems are utilized in some soils that are not suitable for conventional soil absorption fields. Rather than a five-to-six foot depth to water table required for soil absorption, only a three foot depth to water table is normally required with sand mounds. The mound itself provides an unsaturated soil depth for additional treatment with increased wastewater retention capacity which results in higher treatment efficiency.

Evapotranspiration beds allow wastewater to be utilized by plants and evaporated into the atmosphere. These beds can be used only where evaporation and transpiration exceeds precipitation. Evapotranspiration beds are larger than soil absorption fields for two primary reasons: 1) percolation is generally more rapid than evaporation and transpiration, 2) significant surface exposure area is needed to obtain satisfactory evapotranspiration rates. Within Leon County, climate conditions prevent the use of evapotranspiration beds during the wettest months of the year because evaporation does not exceed rainfall by more than two inches per month. These disposal methods are compared with soil absorption systems in Table II.9.

Small Community Systems

When it is determined that on-site disposal systems are not to be used in a given community or subdivision, and conventional wastewater collection and treatment is considered too expensive, alternative systems need to be considered. These systems are available in a variety of different types and combinations.

Four types of small community treatment systems have been successfully utilized and are presented in Table II.10. Each system can produce an effluent suitable for disposal via infiltration to soil. However,

TABLE II.9
Alternate On-Site Disposal Systems

System	Approx. Cost July 1980 Tallah. $	Oper. and Maintenance	Energy Use	Reliability/Implementability
Soil Absorption Field	$1.15 to 1.50 per square foot of field area for construction; $600 perlome for only pump and tank, if needed.	Periodic resting of system prolong life, pump maintenance is needed if pump is utilized.	Moderate if pump is utilized	Restricted to soils with a depth to water table of five feet or more.
Sand Mound	$2,000 per home installation	Pump or siphon maintenance and periodic replacement of top 2-4" of sand.	Moderate if pump is needed	3-foot depth to water table needed.
Evapotranspiration Bed	$1.00 to 1.50 per square foot of bed area for construction. Main costs not presented.	Periodic removal of salt deposits.	Moderate if pump is needed	Only useful in areas with arid climate unless back-up storage is provided.

TABLE II.10
Small Community Treatment Systems

System	Approx. Cost July 1980 Tallah. $	Oper. and Maintenance	Energy Use	Reliability/ Implementability
Sand filter	$5 to $15 per square foot of surface area plus $1 per square foot per year	Pump maintenance. Periodic replacement of top 2 to 4 in. of sand	Moderate if pumping is needed.	High seasonal groundwater table can be a problem if built into the ground. Usually preceded by septic tank.
Extended aeration	$0.80 to $2.20 per 1,000 gallons of wastewater treated per year	Frequent inspection, and a high level of operation required	High, aeration and pumping are both required	Poor maintenance can cause odors. Sludge and wastewater require disposal.
Aerated Lagoons	$0.30 to 0.50 per 1,000 gallons of wastewater treated per year	Variable depending on lagoon operation	Low, possibly for pumping or aeration	Large land requirements potential odor problems use for treatment is sensitive to climate conditions.
Rotating biological contactor	Not given	Little needed other than periodic inspection	Low	Susceptible to climate and damage unless housed. Usually preceded by septic tank.

each system also has disadvantages. Sand filters can become saturated during rainy periods depending on surrounding soil conditions. Extended aeration systems require frequent inspections and have high energy requirements. Aerated lagoons have large land requirements, with treatment efficiencies that vary with seasonal changes in temperature. Rotating biological contactors represent a relatively new technology. Both the biological contactor and the sand filter would need to be preceded by a sedimentation chamber.

Small Community Disposal Systems

Small community disposal systems, presented in Table II.11, include evaporation-percolation ponds and irrigation systems as well as soil absorption and sand mound systems. Both ponds and irrigation systems become more competitive as larger flows are handled. Land requirements are large for each system because infiltration is the primary means of disposal. However, land requirements for ponds and irrigation systems are not as large as for soil absorption fields or sand mounds because the former systems utilize evaporation and transpiration as well as percolation.

Small Community Collection Systems

Alternative collection systems were discussed in an earlier section; however, specific references to advantages and disadvantages of viable systems was retained for this section.

The choice between gravity and pressure sewer systems is based largely on costs. Other considerations are operability and reliability of the various systems, amounts of inflow and infiltration of water to the sewers, effects of concentrated wastewater on treatment plants, and amounts of water used by residents.

Gravity Sewers: The gravity collection system is the most common type of collection system presently found in the United States. It consists generally of manholes and collection lines. Gravity sewers may be unsuitable because of physical, economical, or ecological concerns. Under these circumstances, pump stations are employed with the use of pressurized force main sewers.

Pipes used in gravity systems are much larger than those found in pressure collection systems. The minimum pipe diameter is normally eight feet below ground level. Manholes are located at maximum intervals of 400 feet or at pipe junctions, changes in pipe slope, or wherever pipe sizes change.

Pipe slopes are installed so that when flowing full or half full, the velocity will be a minimum of 2 feet per second. This velocity is needed to keep the pipes free of settleable materials. At lower velocities, material will begin to settle out and be deposited within the pipe.

TABLE II.11

SMALL COMMUNITY DISPOSAL SYSTEMS

System	Approximate Cost (1977 dollars)	Operation and Maintenance	Energy Use	Reliability/Implementability
Evaporation-Percolation Pond	$0.30 to $0.50 per 1,000 gallons of wastewater disposed.	Variable.	Possible for pumping wastewater to the pond	Odors and pests can be a problem particularly if wastewater is not pretreated.
Soil Absorption	$1.15 to $1.50 per square foot for construction.	Little. Periodic resting of system prolongs life. Pump maintenance is needed if pump is used.	Moderate if pump is utilized.	Restricted to areas with deep and moderately to well-drained soils.
Sand Mound	$0.75 to $3.00 per square foot of basal area for construction of mound and pumping chamber.	Pump or siphon maintenance and periodic replacement of top two to four inches of sand.	Moderate if pump is utilized.	Use is not as restricted as use of soil absorption systems. Principal application has been for single homes and businesses. Size of a system is only limited by site conditions.
Irrigation	Costs per unit volume of treated effluent are higher than for larger, municipal flows.	Variable depending on type of irrigation system.	Variable depending on type of irrigation system.	Restricted to areas with deep and moderately to well-drained soils. Holding pond is needed.

Advantages and disadvantages associated with gravity collection systems are as follows:

Advantages:

- Pumping may not be necessary
- Low operation and maintenance (O&M) costs

Disadvantages:

- High construction costs
- Deep excavation may be necessary
- Pump stations may proliferate in certain terrains (high construction and O&M costs)
- High infiltration and inflow (I/I)

An advantage of a gravity collection system over a pressure system is that there may be little, if any, need for mechanical equipment within the system. Operation and maintenance (O&M) costs of such equipment can be very high. For this reason, O&M costs for gravity systems are much less than for mechanically dependent pressure systems. Another advantage of a gravity system is that repairs of broken pipes may not need to be repaired immediately depending on the effects the break has on the pipe's flow and the environment.

The disadvantages of a gravity system are all related to high construction costs. Generally, the construction costs of a gravity-type collection system can be 60 to 80 percent higher than construction costs for pressure systems in a small community. Reasons for this are larger pipe sizes and pipes usually being placed in excess of eight feet below the ground surface. Pressure sewers need only be placed just below the frost line or at depths where surface activities will have no effect. Also, in areas where gravity lines cannot be used for any of the reasons stated earlier and pump stations are required, construction costs will increase accordingly, along with O&M costs for the collection system. Infiltration rates must be taken into account when designing a gravity collection system. In sewer design, infiltration is considered to include extraneous water plus groundwater leakage. Increased flows due to infiltration will be reflected in the need for larger pipe sizes, treatment plant capacities and ultimately higher construction costs.

Although construction costs are high for a gravity system, the O&M costs of these lines are very low. These low O&M costs are the reason this type of collection system is generally used for providing sewers to newly developed areas.

Pressure Sewers: A pressure sewer system operates in a manner similar to a water distribution system; the major difference is that a water system has only one source and many outlets and a pressurized sewer has many sources and only one outlet.

There are two major types of pressure sewer systems: the grinder pump (GP) system and the septic tank effluent pump (STEP) system. The differences between these systems are found at the home. The first utilizes a grinder pump which injects all the household wastes from a septic tank into a pressurized line. Through the use of baffles within the tank, the pump draws off only the septic tank effluent leaving behind the settled solids and the floating oils and greases. This septic tank, therefore, needs to be cleaned every three to five years.

A pressurized system can also be used in conjunction with a gravity system. Small areas, such as subdivisions, might utilize a pressurized system that would discharge into a larger gravity line.

Pressure sewer systems have a number of advantages and disadvantages over the conventional gravity sewer system and are listed below:

Advantages:

- Lower collection system construction costs
- Elimination of infiltration and inflow

Disadvantages:

- Higher waste concentrations
- Presence of hydrogen sulfide odors at a wastewater treatment plant
- Higher O&M costs particularly for pumps and leak detection
- Greater use of energy

In small rural communities, the installation of a gravity-type collection system can account for 75 to 90 percent of the total costs for the entire sewerage system. With the use of a pressure system, the sewer lines are of a much smaller diameter and need only be buried just below the frost line, or at depths where the pipes will not be affected by surface activity. In a cost comparison analysis published by EPA, reported savings of 40 percent to 50 percent of the costs of a collection system may be realized when using a pressure system over a gravity system in a small community.

Due to the pressure within these systems, groundwater infiltration and inflow is eliminated. Pipes and treatment plants can, therefore, be designed for only the expected waste generation.

Pressurized systems do, however, have some disadvantages. Due to the elimination of infiltration/inflow, the wastewater may be more concentrated especially in the GP system. This higher concentration may require a higher level of treatment than is required with gravity systems to satisfy treatment efficiency requirements. Second, the wastewaters entering a plant will also be devoid of oxygen which could create odors in the form of hydrogen sulfide. Some form of pretreatment within the collection system, therefore, may need to take place. If a combination pressure and gravity collection system is used, pretreatment at the point of entry from the pressure system to the gravity system may be needed. Third, operation and maintenance costs are higher for a pressurized system than for a gravity system. This cost is related to the use of mechanical equipment at each point of entry into the collection system. Finally, increased power costs due to the GP and STEP units need to be considered. Assuming that per capita flow is 50 gallons per day, the monthly power costs for a GP unit would be 30 cents per month, based on five cents per Kilowatt-hour and energy use of one watt-hour. Power costs for 0.33 hp STEP systems would be about 20 cents per month.

Pressure sewer systems have been used for many years in the form of lift stations and force mains. This practice was begun in order to prevent the need for excessively deep trenches for sewer lines and to aid homes where water-using facilities may have been located at elevations lower than the existing sewer lines. Within the past 15 years, however, pressurized systems have begun to emerge as viable alternatives to the standard gravity system, under certain circumstances. Places in which a pressure system could be an attractive alternative are in small, low density areas; in hilly terrain; wherever rocky conditions prevail; in waterfront locations; and in areas having flat land or a water table that is near the soil surface.

6. LAKE BRADFORD PLANT EVALUATION

The Lake Bradford Plant treats institutional wastewater flows from the state government complex, Florida State University and Florida A&M, with an average design flow of 4.5 mgd. Excess flows are diverted to the T.P. Smith/Southwest Treatment Facility. The net result is a uniform flow entering the Lake Bradford Plant with BOD and suspended solid removals indicative of excellent treatment. Currently, treatment standards call for removal of 90 percent of BOD and suspended solids until expansion of the T. P. Smith Treatment Facility to a 17.5 mgd capacity is completed. At that time, the plant, which presently discharges into Munson Slough, must facilitate a land disposal plan.

On-site plant inspections and interviews with operating staff were conducted by the EIS consultants on June 18, 1980, to assess the general conditions of plant equipment and structures. The results of the inspection indicate that the plant's equipment and structure are in generally good shape. Although the plant is 30 years old there is no evidence of plant-wide deterioration. The only recommendations for upgrading the plant concerned minor changes that could be covered within an operation and maintenance budget. No capital expenditure is needed for the upgrading of the Lake Bradford Treatment Plant.

However, capital expenditures are needed to remove the Lake Bradford Plant effluent from Munson Slough. The Draft Alternatives Development Task Report of the EIS study determined that land application was the only feasible disposal alternative available to the study area. If the Lake Bradford Plant is to be left open, effluent from the plant is assumed to be handled best by transporting it to the Southwest holding ponds, located adjacent to the T.P Smith Treatment facility, prior to eventual disposal by land application. The reasons behind this assumption are:

- The T.P. Smith holding ponds are a reasonable distance from the Lake Bradford plant.

- The similarity in treatment levels and processes between the two treatment facilities will not result in any major changes in wastewater disposal operations.

- The 22.5 mgd capacity of the Southwest force main transmission line allows the Lake Bradford effluent to be transported to the southeast sprayfield, if desired.

- Greater centralization of wastewater effluent is made possible by transporting the Lake Bradford effluent to the T.P. Smith facility.

As an alternative to continuing to operate the Lake Bradford Plant, the T.P. Smith Treatment Facility could be expanded beyond its 17.5-mgd capacity to meet the Southwest service area treatment needs in the year 2000. A cost summary of this alternative is shown in Table II.12. If the Lake Bradford Plant does not stay open, it is assumed that additional capacity would be needed in the Southwest service area in 1990.

The question is at which point is it more cost-effective to expand the T.P. Smith Plant rather than operating the Lake Bradford Plant? Figure II.4 graphically describes that, if additional flows of less than 4.2 mgd are needed in the system, then it is more economical to expand the T.P. Smith Plant; at higher flows, it is less costly to continue to operate the Lake Bradford Plant. This analysis assumes that:

- Expansion of T. P. Smith Plant occurs in 1990.

- Activated sludge treatment process is used for the expansion.

- Costs of expansion reflect capital and O&M costs for a new plant as described in Part D. Section 1 of this Chapter.

- Salvage value is taken in the year 2000.

- Costs of a new treatment plant, summarized on Table II.13, are the basis of the cost curve on expanding the T. P. Smith Plant.

7. WASTEWATER MANAGEMENT SYSTEM ALTERNATIVES

Four comprehensive wastewater management alternatives are identified in Section 1. The first three alternative systems which have been proposed represent various service area configurations and call for some degree of federal participation in the form of federal grants. The fourth alternative is a scenario which tries to simulate wastewater management in the Tallahassee-Leon County study area if federal funds are not provided or are provided in only a limited manner, such as for conveyance systems. This alternative, the No-Federal Action Alternative, is discussed in the following section.

TABLE II.12
SUMMARY OF COSTS OF
CONTINUING OPERATION OF LAKE BRADFORD PLANT

Capital Expenditure

. 9,000 feet of 30" Gravity Sewer at $98/linear foot*	$ 882,000
. 7,000 feet of 20" Force Main at $68/linear foot*	476,000
. 4.5 mgd Pump Station	542,000
Total Capital Expenditure	$1,900,000

Annual Operation and Maintenance (O&M)

. O&M Lake Bradford Treatment Plant**	$ 400,000
. O&M for 4.5 mgd Pump Station	31,000
. O&M for 9,000 feet of 30" Gravity Sewer	2,700
. O&M for 7,000 feet of 20" Force Main	1,900
Total Annual O&M Cost	$ 435,600

Present Worth Analysis

. Assumptions: Discount rate = 7 1/8%; operates 1982-2000, 18 years. Salvage Value only of conveyance & pumping construction costs w/o contingencies.

PW = 1,900,000 (P/F, 7 1/8%, 2) + 435,600 (P/A, 7 1/8%, 18) (P/F, 7 1/8%, 2) - 835,320 (P/F, 7 1/8%, 20)

PW = 1,655,660 + 3,784,050 - 210,830

PW = $5,228,880

---

* Includes contingencies for engineering, legal, and administrative costs.

** Average of O&M costs during 1977 and 1978, as supplied by City of Tallahassee.

FIGURE II.4
PRESENT WORTH COSTS OF CONTINUING
TO OPERATE LAKE BRADFORD STP
VS.
EXPANDING T.P. SMITH STP

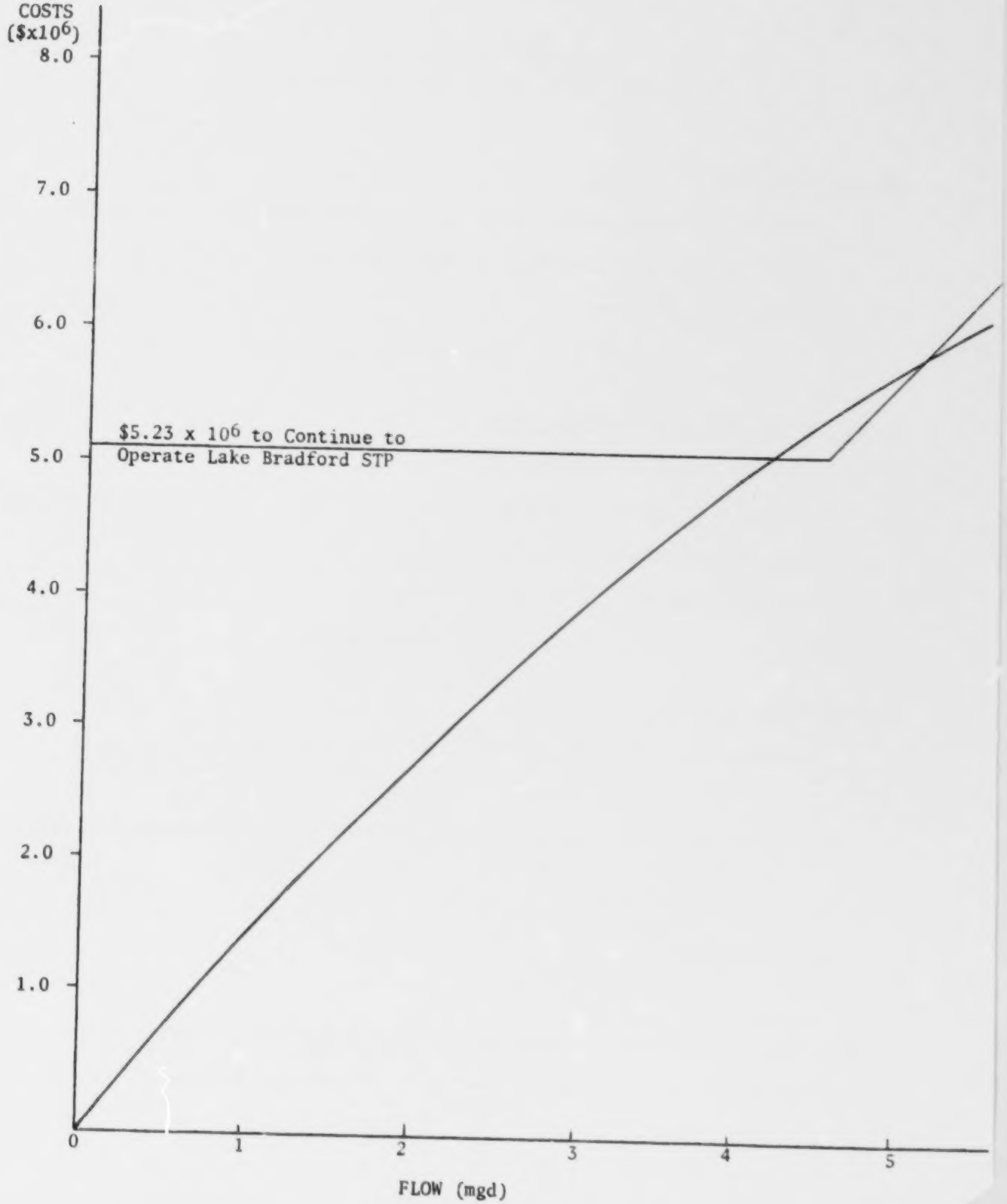


TABLE II.13

SUMMARY OF T.P. SMITH EXPANSION COSTS

Flow	(1) Construction Cost	(2) Total Project Cost	(3) Annual O&M Cost	(4) Salvage Value	(5) Net Present Worth
1.0 MGD	$1,766,000	$2,295,800	$96,600	$1,094,980	$1,215,990
2.0 MGD	3,826,130	4,334,320	190,540	2,372,200	2,247,370
4.0 MGD	7,254,400	9,430,720	375,830	4,497,730	4,921,440
5.0 MGD	9,976,550	11,301,640	467,700	6,185,460	5,757,750

Assumptions:

- Construction in 1990
- O&M cost incurred from 1990 - 2000
- Salvage Value = 32.5%

(1) Table

(2) 1.30 x (1)

(3) $9.66 \times 10^4 Q^{0.98}$

(4) .325 x (1)

(5) (2) x (P/F, 7 1/8%, 10) + (3) x (P/A, 7 1/8%, 10) (P/F, 7 1/8%,10) - (4) x (P/F, 7 1/8%, 20)

= (2) x .5024 + (3) x 3.5087 - (4) x .2524

For each of the three federal action alternatives, selections of preferred treatment and disposal options are needed. Without these selections, specific costs, environmental impacts and other evaluation factors cannot be quantified. The EIS screened the available collection, treatment and disposal technologies for wastewater management, and determined the most feasible options appropriate to the study area as described in the previous sections. Table II.14 summarizes the feasible component system combinations evaluated for the study area.

Preferred treatment options were selected primarily so costs for each federal action alternative could be specified. Preferred options are the same for each proposed treatment plant. Table II-15 gives the options, decision-making factors and selected or preferred options. While these decisions are basically engineering judgments, they are not meant to dictate to the study area which options would be federally funded and which would not. The options were selected which reflect the least environmentally sensitive and most economically and technically sound implementation schemes. Secondary treatment of wastewater is the minimum level of treatment allowable for land application by the Florida DER within the study area. Advanced wastewater treatment is not considered necessary for the study area. A final selection of a preferred secondary treatment option would need to include bench-scale tests of all secondary treatment options with local wastes. Similar bench-scale tests would be needed before selection of preferred sludge treatment processes can be finalized.

Disposal options are subject to more qualitative judgment and debate than treatment options primarily because their environmental impacts are not readily quantifiable. Table II.16 presents wastewater and sludge disposal options and also sludge transport options. The only wastewater disposal options which were evaluated in detail were land application options. Surface water discharges and other disposal options were eliminated from consideration during the Alternatives Development stage of this EIS as inappropriate for use in the study area due to cost, environmental or technical reasons. Slow-rate land application is the selected option for all areas except the Northeast where the availability of suitable sites and higher land costs favor rapid infiltration.

The selected option for sludge disposal at any suitable location in the study area is landspreading. The option would supplement the planned 17.5-mgd sludge handling and disposal system already approved for funding by the EPA. Costs for incineration and the uncertainty with composting operations (a lack of familiarity with the composting process in the area, uncertainty about obtaining suitable bulking agents and viable markets, necessary energy requirements) reduce the options to landspreading or landfilling. Somewhat lower costs for landspreading combined with the fact that metals and nutrients would be spread over a larger area and recycled by using disposal areas for crop production favor the landspreading option particularly if certain measures are employed to further reduce environmental impacts. These measures are discussed in Part D, Section 4 of this Chapter.

For sludge transport, pipelines do not allow the flexibility needed if sludge disposal sites are relocated. Costs are also higher than for other transporting methods. The choice between hauling sludge by tank or by truck is inconsequential to this EIS.

TABLE II.14

SUMMARY OF FEASIBLE SYSTEM COMBINATIONS

Alternative System	Service Areas	Plant Location	Capacity (mgd) w/o FRM	Capacity (mgd) w/ FRM	Treatment Technique	Effluent Disposal Options	Effluent Disposal Sites	Sludge Disposal Options	Sludge Disposal Sites
1	SW/SE	TPS/SW	20.2	18.1	AS	SR	SE SW	LF LS C I	Adj. to Plant, Airport
	NE	NE	2.1	1.8	AS RBC	SR RI	NE(A) SE(B)	LF LS C I	Adj. to Plant, Airport
2	SW/SE/NE	TPS/SW and LBP	22.3*	19.9	AS	SR	SE SW	LF LS C I	Adj. to Plant, Airport
3	SW	TPS/SW	21.0	18.9	AS	SR	SE SW	LF LS C I	Adj. to Plant, Airport
	SE/NE	SE	1.3	1.0	AS RBC	SR	SE	LF LS C I	Adj. to Plant, Airport
4 or No Federal Action Alternative	SW**	TPS/SW	17.5	17.5	AS	SR	SE	LF	Adj. to Plant
	Growth Portions of Study Area	NA	NA	NA	ST/SC	SA	Local	NA	NA

Abreviation:
SW = Southwest
NE = Northeast
SE = Southeast
FRM = Flow Reduction Measures

TPS/SW = T.P. Smith/Southwest Treatment Facility
LBP = Lake Bradford Treatment Plant
NA = Not Applicable
AS = Activated sludge
RBC = Rotating Biological Contactor
ST/SC = Septic Tank/Small Comunity Systems
SA = Soil Absorption

SR = Slow Rate
RI = Rapid Infiltration
LF = Landfilling
LS = Landspreading
C = Composting
I = Incineration

* Lake Bradford Plant is recommended for use under this alternative system only

** Infilling population that is expected to take place within the existing service area boundaries is expected to generate 17.5 mgd of wastewater.

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TABLE II.15
WASTEWATER AND SLUDGE TREATMENT OPTIONS FOR MUNICIPAL SYSTEMS

Options	Key Factors Considered in Analysis	Selected Option
Secondary Wastewater Treatment (to follow primary treatment)		
1. Activated sludge 2. Rotating biological contactor	- Costs as a function of treatment capacity - Treatment efficiency and reliability under changing conditions (flows, loads, temp., etc.) - Operation and maintenance needs - Local experience with process operation - Compatibility with disposal methods and other treatment processes	Activated sludge
Sludge stabilization		
1. Aerobic digestion 2. Anaerobic digestion 3. Chlorine 4. Heat treatment 5. Lime 6. Long-term storage	- Costs - Operation and maintenance needs - Reliability - Energy usage - Compatibility with disposal methods and other sludge treatment processes	Anaerobic digestion followed by lime treatment
Sludge conditioning and dewatering		
1. Chemical conditioning 2. Thermal conditioning 3. Belt filter press 4. Centrifuge 5. Drying 6. Vacuum filtration	- Same as for sludge stabilization	Chemical conditioning followed by vacuum filtration

TABLE II.16
WASTEWATER AND SLUDGE DISPOSAL OPTIONS FOR MUNICIPAL SYSTEMS

Options	Key Factors Considered in Analysis	Selected Option
Wastewater disposal		
Slow-rate land application	- Costs - Public Health - Past Experience - Land Costs - Terrestrial Ecosystem Impacts	Slow- Rate - Southeast
Rapid infiltration		Rapid Infiltration - Northeast
Sludge transport		
Pipeline	- Costs - Operational Flexibility - Construction-related Impacts	Tank haul for liquid sludge Truck haul for dewatered sludge
Tank haul		
Truck haul		
Sludge disposal		
Landspreading	- Costs - Heavy Metal Input to Soil - Transmission of Pathogens by Air - Land Use Factors - Energy Usage - Local Experience with Option	Landspreading
Landfilling		
Composting		
Incineration		

Inherent in all four alternatives is a decision to close the existing Dale Mabry and Lake Bradford treatment plants. The Dale Mabry plant has little remaining service life while only being able to handle an average flow of 0.9 mgd. A separate evaluation was conducted for the Lake Bradford plant. A decision, for each of the alternatives, to close the plant or keep it in service was based on this analysis. With approval of the Phase 1 expansion of the T.P. Smith plant to 17.5 mgd, the Lake Bradford capacity would not be needed, based on cost considerations, unless treatment needs for the Southwest service area exceed 17.5 mgd plus 4.2 mgd, or 21.7 mgd. The additional wastewater capacity need of 4.2 mgd represents the point where continuing to operate the Lake Bradford Plant is cost-effective. Needed flow capacity less than 4.2 mgd should be met by closing Lake Bradford and expanding the T.P. Smith Plant. As a result of the decision the Lake Bradford plant is only included in Alternative 2.

Table II.17 shows the basic alternatives for the study area given the preferred options and flow projections previously stated. Treatment and disposal capacity needs are based on 22.3 mgd without flow reduction measures and 19.9 mgd with flow reduction measures. Boundaries of the Northeast, Southeast, and Southwest service areas and the proposed sewerage system configuration are delineated in Figure II.5.

Incorporated into each of the alternative systems are the actions under Phase 1 of the 201 Plan facility expansions which include: expanded capacity of 17.5 mgd at the T.P. Smith/Southwest Treatment Facility; expansion of the Southeast Spray Facility to a capacity of 17.5 mgd; and construction of a new 17.5 mgd sludge handling and disposal system. The three federal action alternative systems are described by the following:

Alternative System 1: Under this alternative a new treatment plant would be constructed in the Northeast, and the T.P. Smith/Southwest treatment facility would be expanded beyond its Phase I capacity of 17.5 mgd. A Northeast treatment plant would provide wastewater service in the northeastern growth areas of Leon County. Interceptor sewers would also be extended to developed portions of the Northeast presently served by on-site and small community systems. The expanded T.P. Smith/Southwest plant would serve the Southwest and Southeast service areas. In Alternative 1A, effluent from the T.P. Smith/Southwest plant would be disposed of at the expanded Southeast Sprayfield, with the Northeast Plant effluent disposed by means of rapid infiltration at a Northeast disposal site. Alternative 1A is shown in Figure II.6. Alternative 1B, shown in Figure II.7, is the same as 1A except the Northeast plant effluent is disposed of by conveying the treated wastewater to the expanded Southeast Sprayfield. Sludge disposal for this proposed alternative system would be by landspreading on sites adjacent to the treatment plant in the Southwest and Northeast or by continuing to landspread at the Airport site.

Alternative System 2: The structural configuration of this alternative hinges on the decision whether or not to implement flow reduction measures. The importance of flow reduction measures is based on the judgment to continue operating the Lake Bradford plant if a flow capacity greater than 4.2 mgd was needed in the service area. This occurs when flow reduction measures are not implemented. From our cost analysis described

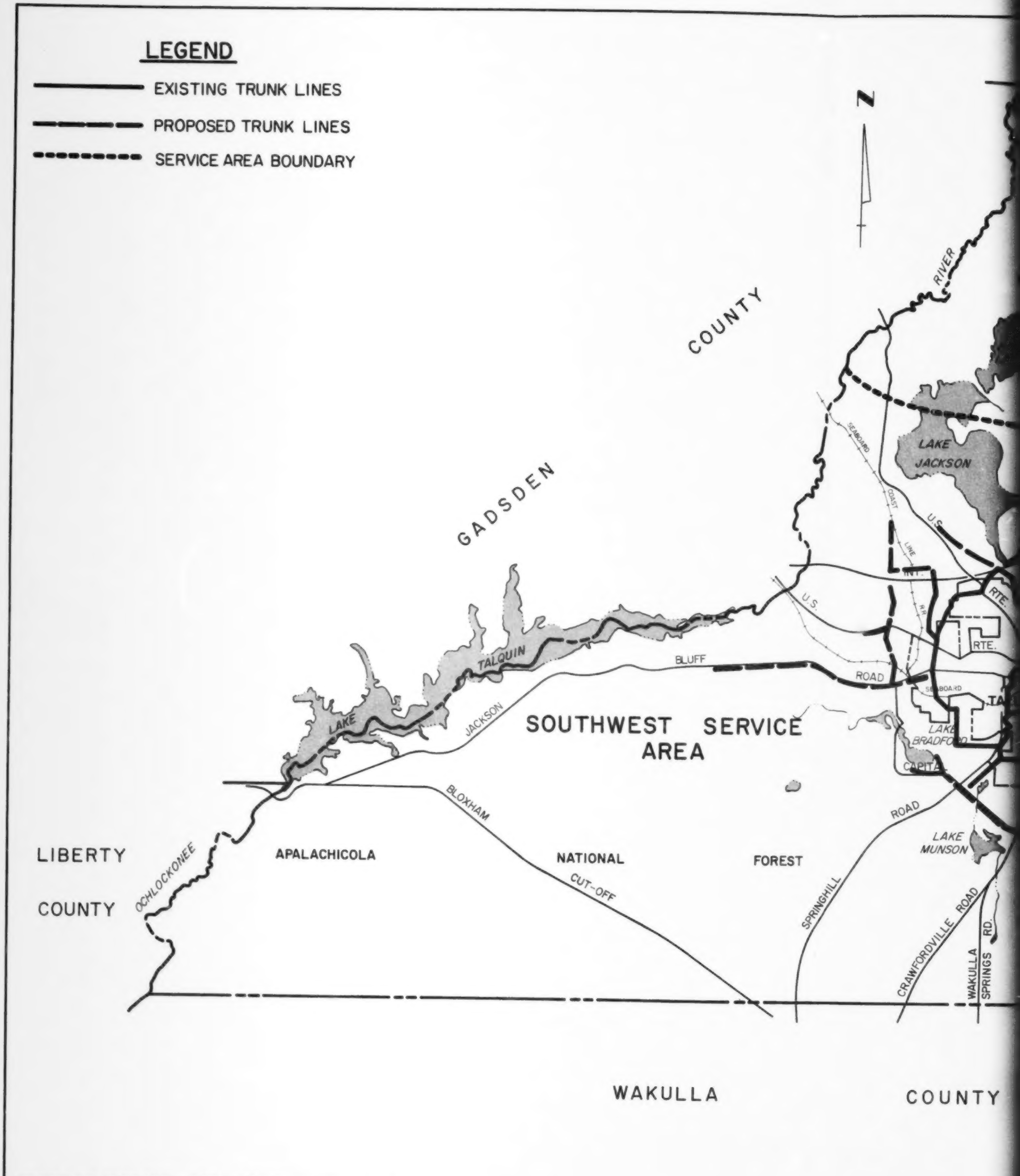
TABLE II.17
BASIC ALTERNATIVES FOR THE TALLAHASSEE-LEON COUNTY
ENVIRONMENTAL IMPACT STATEMENT

Alternative System	Service Areas	Flow Capacity (mgd)		Treatment Plant			Wastewater Disposal			Sludge Disposal		
		W/ FRM	W/O FRM	Location Avail.Cap,mgd	Req'd Add Cap, mgd	Pref.Alt. System	Location Avail.Cap,mgd	Req'd Add Cap,mgd	Pref.Alt. System	Location Avail.Cap,mgd	Req'd Add Cap,mgd	Pref.Alt. System
1A	SW/SE	18.1	20.2	TPS/SW 17.5	0.6W/FRM or 2.7W/O FRM	Expand TPS	SE Sprayfield 17.5 SW Sprayfield 1.0	0.6W/FRM or 2.7W/O FRM	Expand SE Sprayfield	LF Adj to TPS/SW 17.5	0.6W/FRM or 2.7W/O FRM	LS@TPS/SW or LS @ Airport
	NE	1.8	2.1	None	1.8W/FRM or 2.1W/O FRM	New NE Plant	None	1.8W/FRM or 2.1W/OFRM	New RI System @ NE	None	1.8W/FRM or 2.1W/O FRM	LS Adj to Plant or LS @ Airport
1B	SAME AS ABOVE, EXCEPT CONVEY NE PLANT WASTEWATER DISPOSAL TO SE SPRAYFIELD											
2	SW/SE/NE	19.9	22.3	TPS/SW 17.5 LBP 4.5	2.4W/FRM or 4.8W/O FRM	Expand TPS Expand and Continue to operate LBP	SE Sprayfield 17.5 SW Sprayfield 1.0	2.4W/FRM or 4.8W/O FRM	Expand SE Sprayfield	LF Adj to TPS/SW 17.5	2.4W/FRM or 4.8W/O FRM	LS @ TPS/SW or LS @ Airport
3	SW	17.1	18.9	TPS/SW 17.5	1.4W/O FRM	Expand TPS	SE Sprayfield 17.5	1.4W/O FRM	Expand SE Sprayfield	LF Adj to TPS/SW 17.5	1.4W/O FRM	LS @ TPS/SW or LS @ Airport
	SE/NE	2.8	3.3	None	2.8W/FRM or 3.3W/O FRM	New SE Plant	SE Sprayfield 17.5	2.8W/FRM or 3.3W/O FRM	Expand SE Sprayfield	None	2.8W/FRM or 3.3W/O FRM	LS Adj. to Plant or LS @ Airport
4	SW	17.5	17.5	TPS/SW 17.5		N.A.	SE Sprayfield 17.5		N.A.	LF Adj to TPS/SW 17.5		N.A.
(No-Federal Action Alternative)	Growth Portion of Study Area	N.A	N.A.	N.A.		Septic Tank or Small Comm. Systems	N.A.	N.A.	Soil Absorpt. Systems	N.A.	N.A.	N.A.

Abbreviation: SW = Southwest
NE = Northeast
SE = Southeast
FRM = Flow Reduction Measures

TPS/SW = T.P. Smith/Southwest Treatment Facility
LBP = Lake Bradford Plant
N.A. = Not Applicable
SR = Slow Rate

RI = Rapid Infiltration
LS = Landspreading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BLOXHAM CUT-OFF
ROAD
LAKE MUNSON
LIBERTY COUNTY
OCHLOCKONEE
APALACHICOLA NATIONAL FOREST
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
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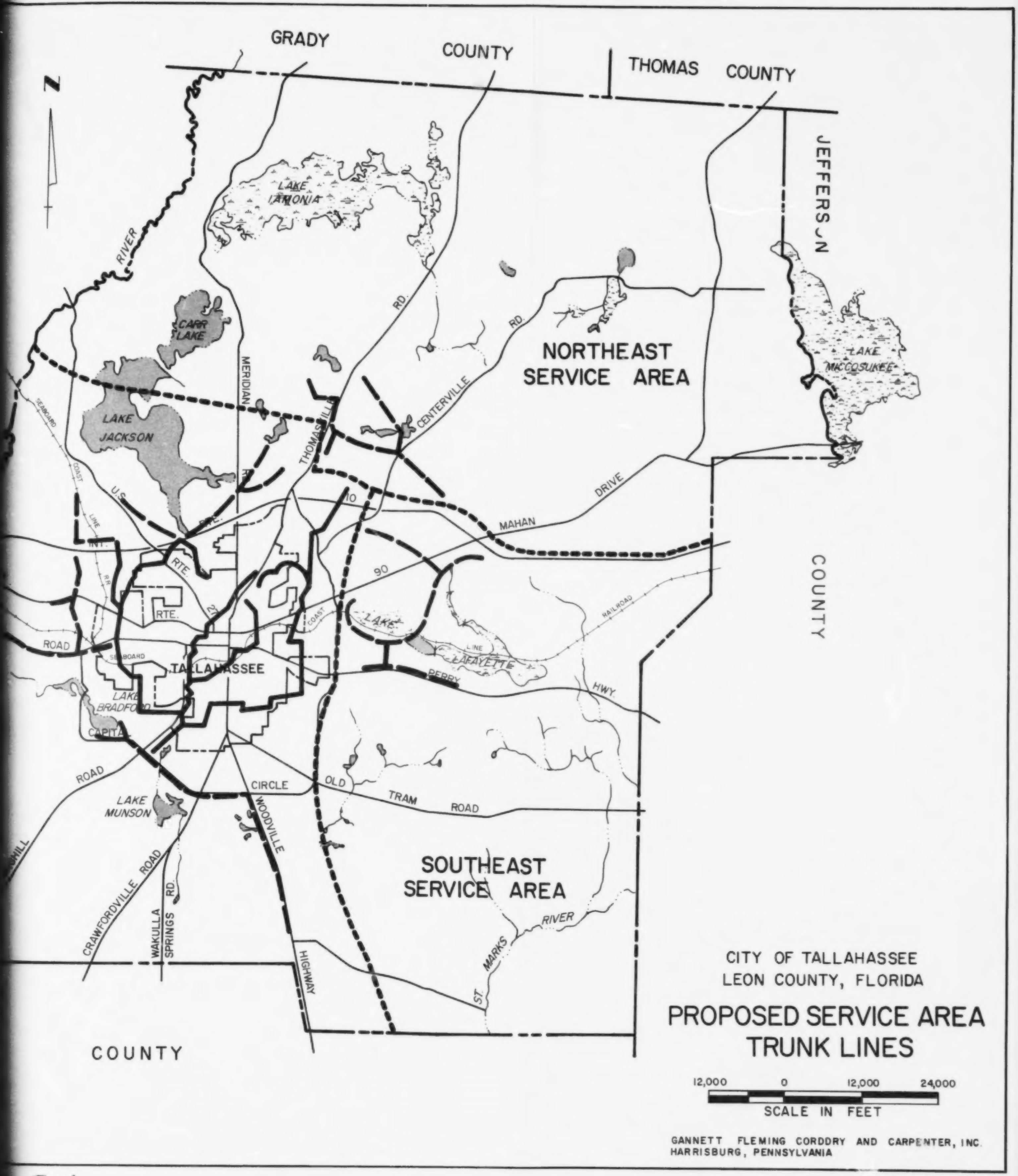
SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP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HWY.
TALLAHASSEE
LAKE BRADFORD
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WOODVILLE
HIGHWAY
LAKE MUNSON
CRAWFORDVILLE ROAD
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MARKS
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CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

PROPOSED SERVICE AREA TRUNK LINES

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SCALE IN FEET

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
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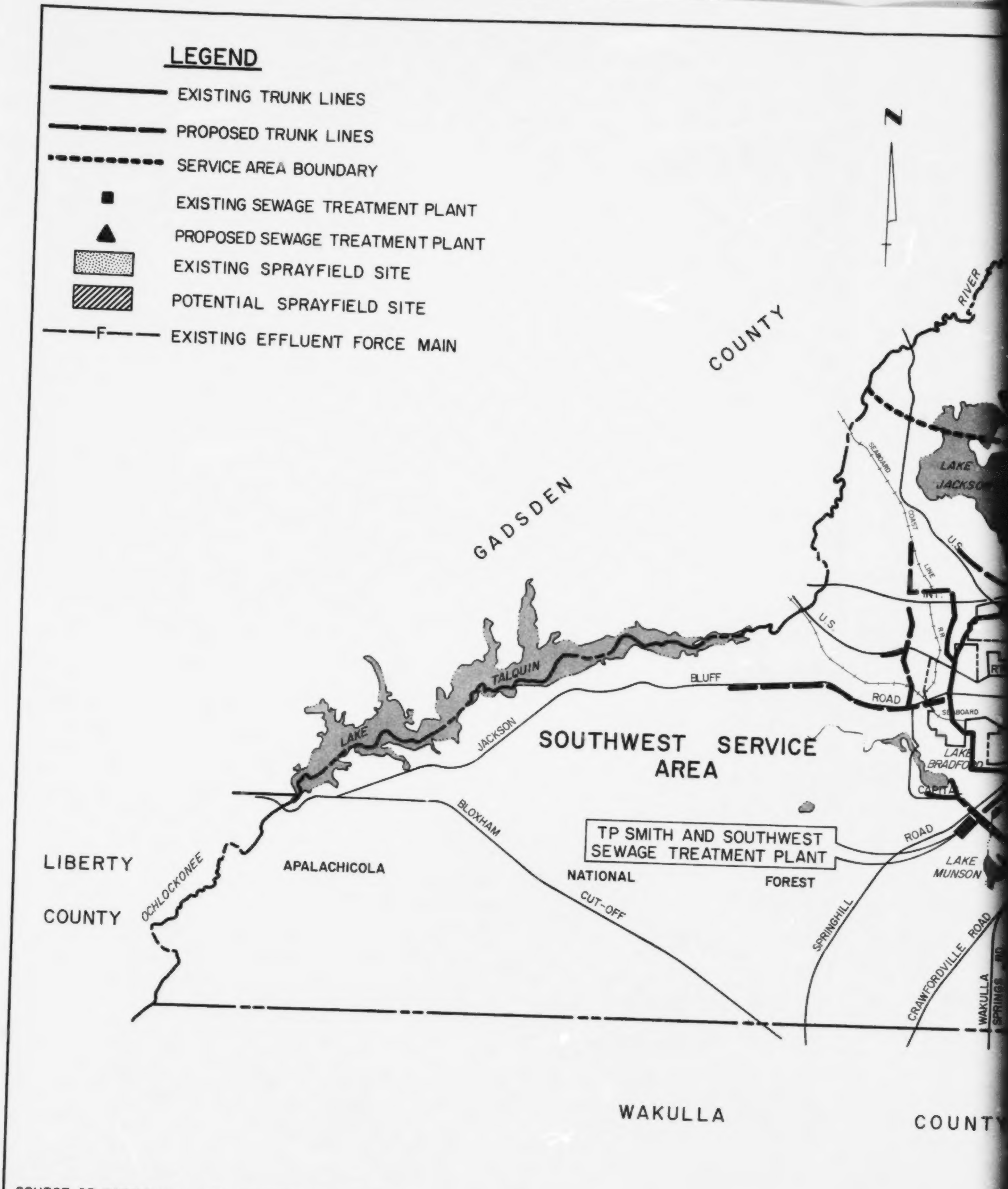
FIGURE II.5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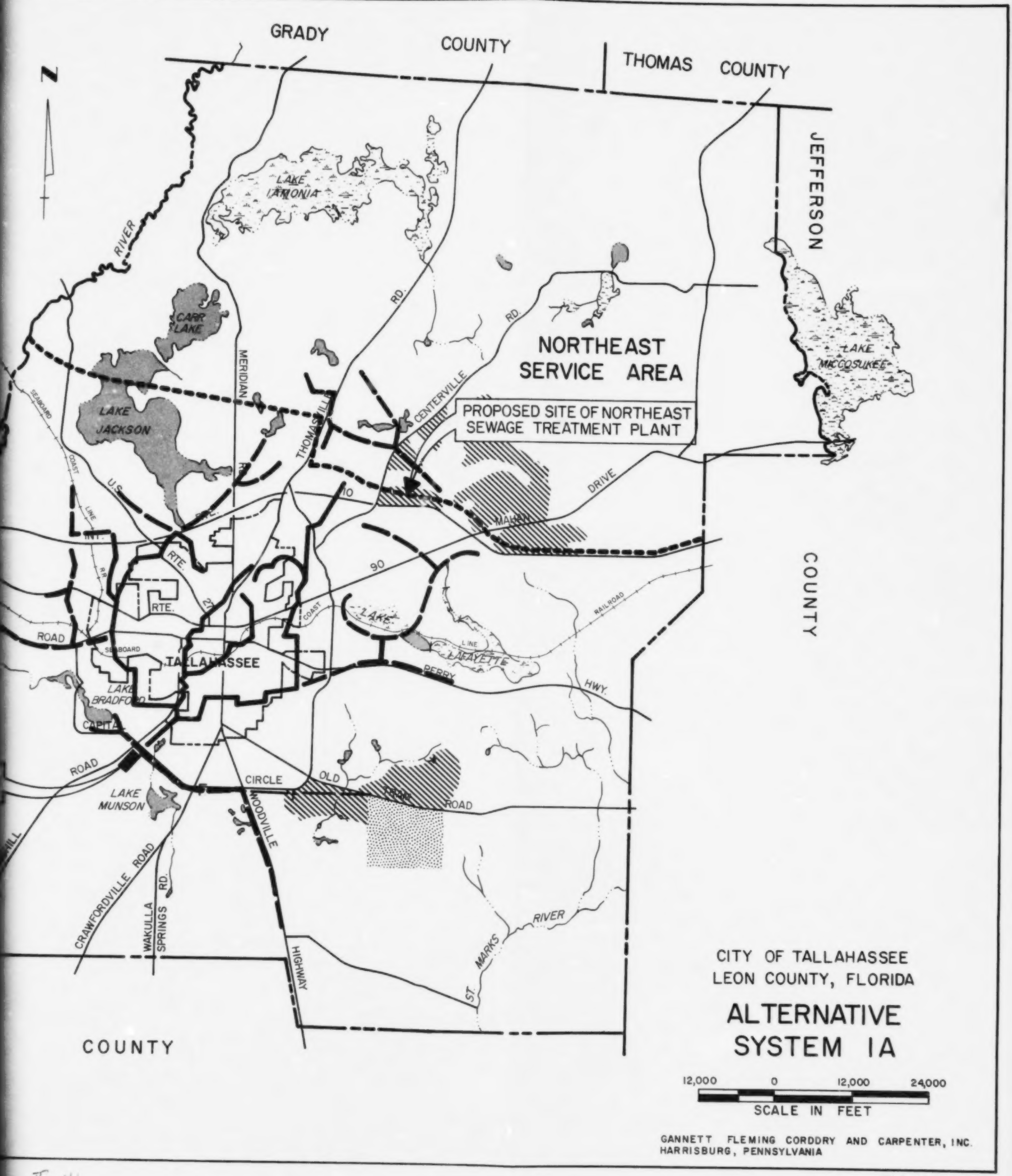
SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP



CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

ALTERNATIVE SYSTEM IA

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

GRADY COUNTY
THOMAS COUNTY
JEFFERSON COUNTY
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LAKE IAMONIA
CARR LAKE
LAKE JACKSON
LAKE MICCOSUKEE
MERIDIAN
THOMASVILLE RD.
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PROPOSED SITE OF NORTHEAST SEWAGE TREATMENT PLANT
SEABOARD COAST LINE RR
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INT. RTE. 10
MAHAN DRIVE
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LAKE LAFAYETTE
PERRY HWY.
TALLAHASSEE
LAKE BRADFORD
CAPITAL CIRCLE
ROAD
OLD ST. AUGUSTINE ROAD
LAKE MUNSON
WOODVILLE HIGHWAY
CRAWFORDVILLE ROAD
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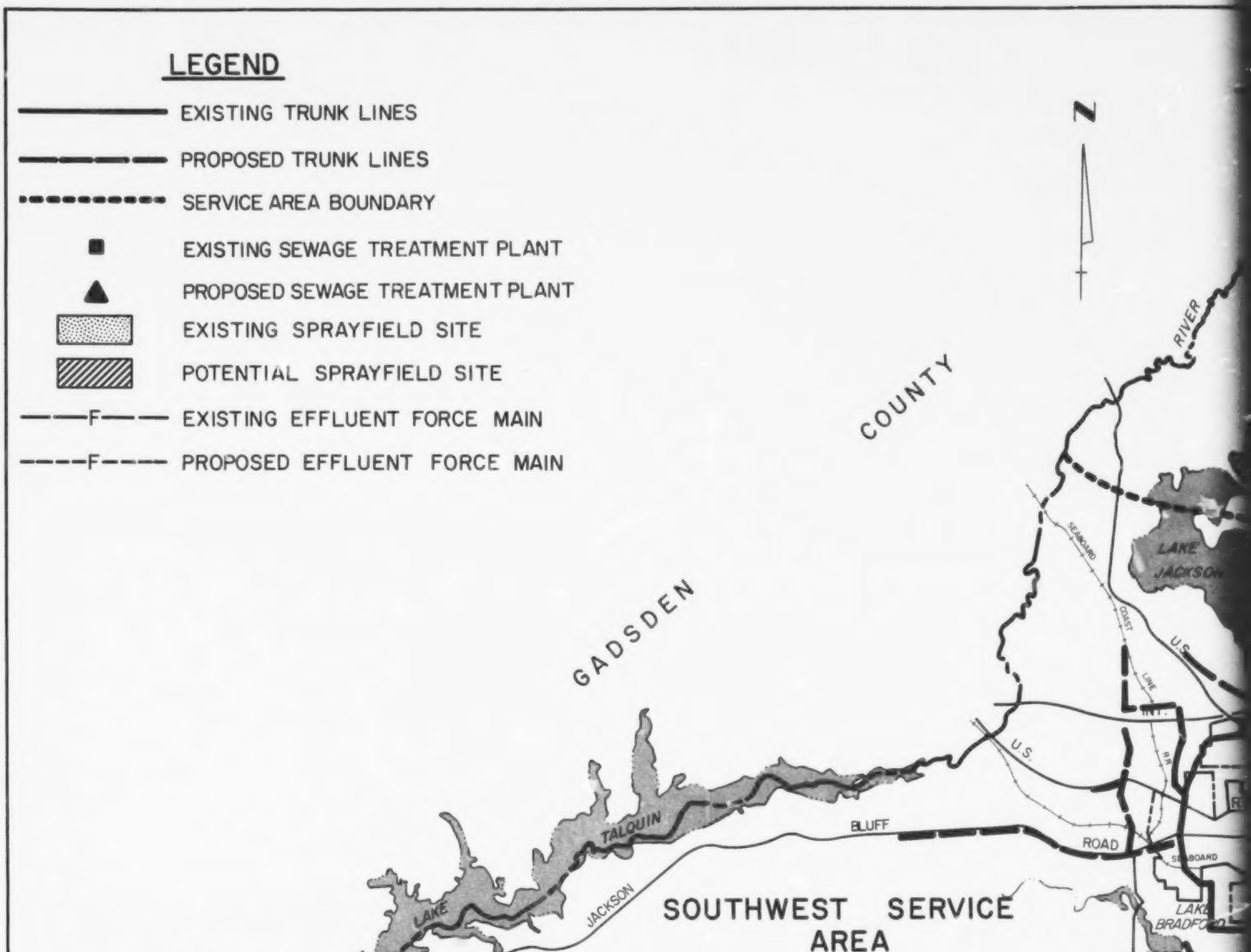
FIGURE II.6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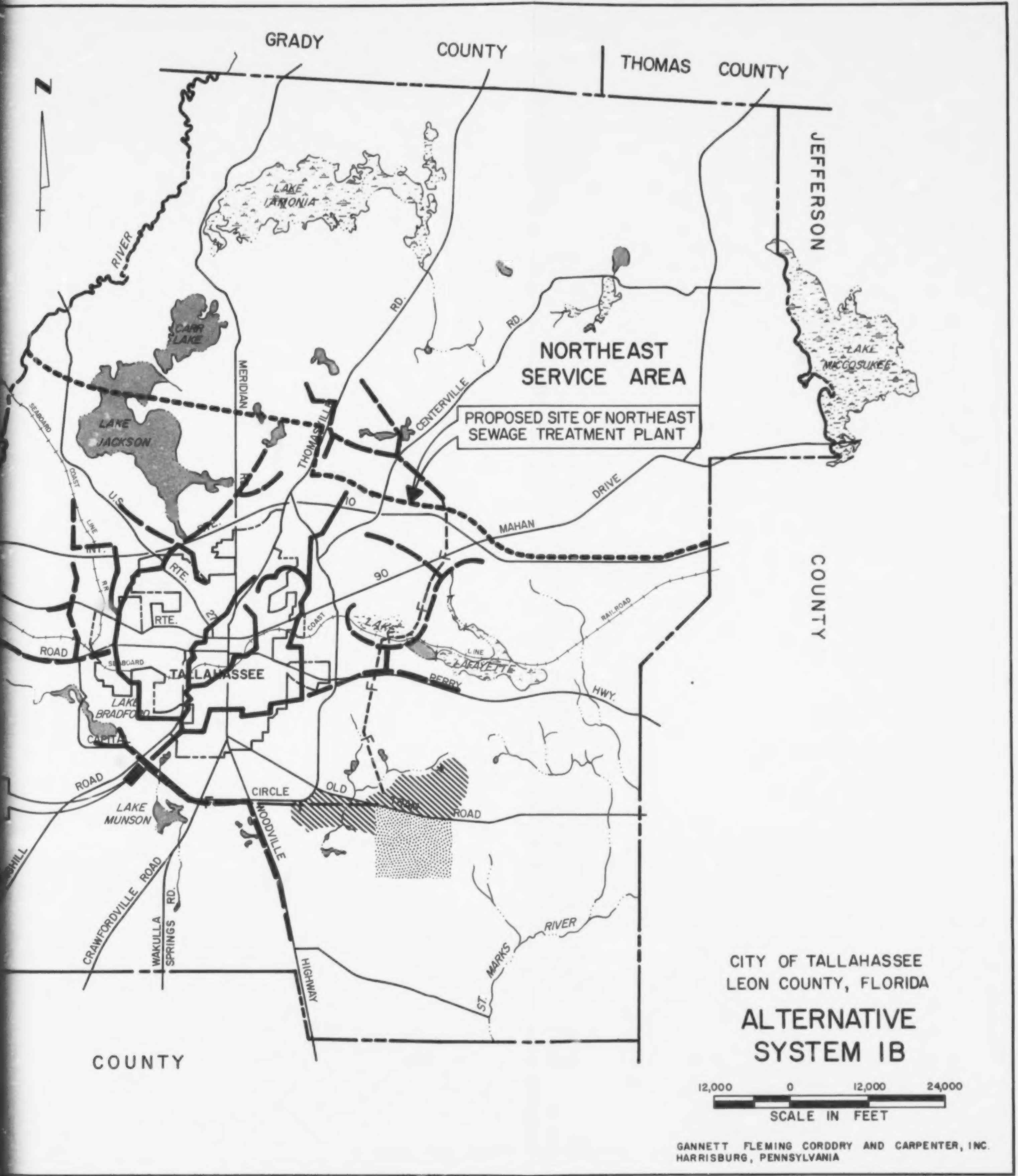
SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP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CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

ALTERNATIVE SYSTEM IB

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GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE II.7

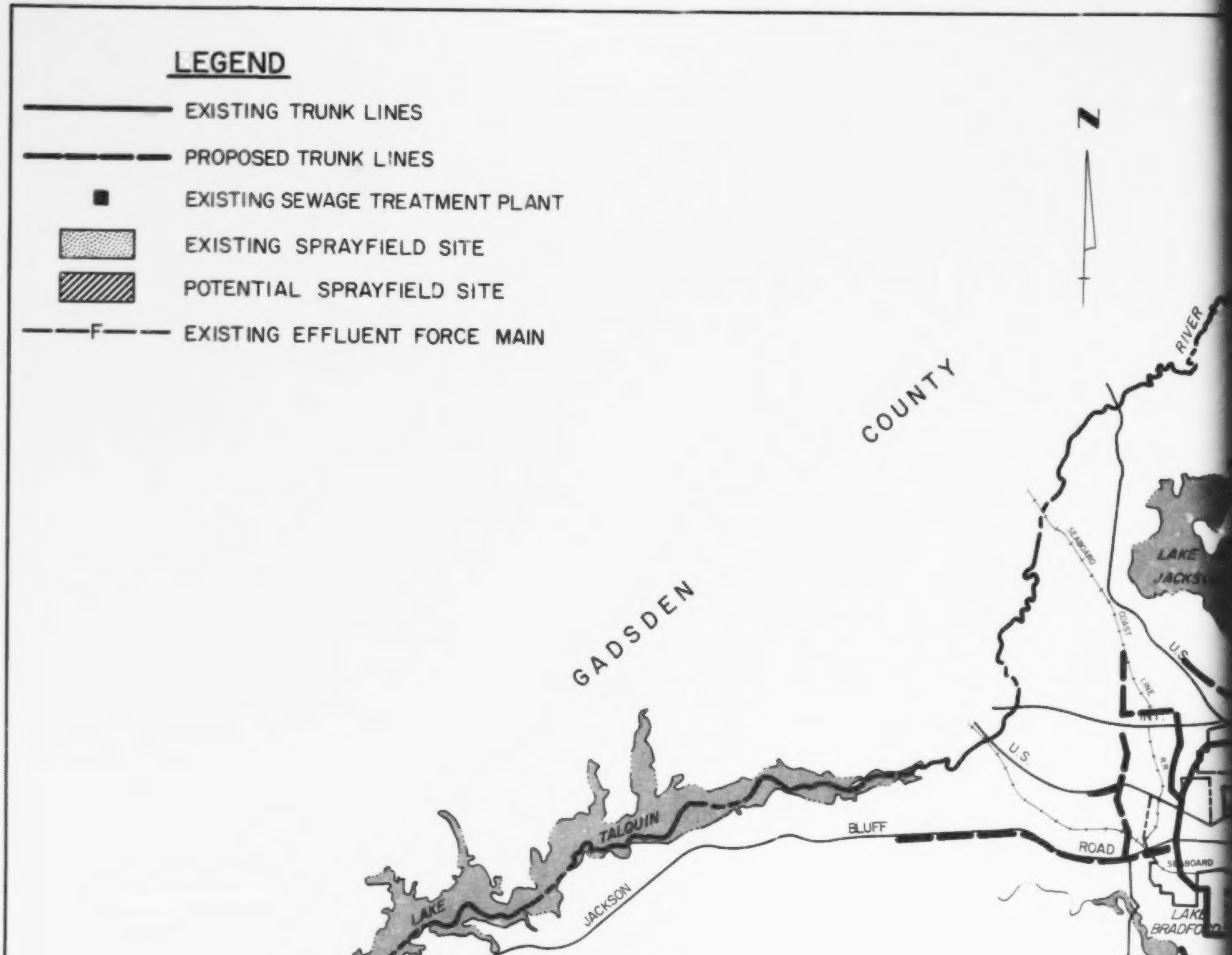
in Part C, Section 6 it has been determined that continuing to operate the Lake Bradford plant at 4.5-mgd, and expanding T. P. Smith/Southwest 0.3 mgd is more cost effective than expanding the T. P. Smith/Southwest by 4.8 mgd. With flow reduction measures, an expanded T.P. Smith/Southwest Treatment Facility would serve the entire sewered area as a regional treatment plant with a 19.9 mgd capacity. This alternative is illustrated in Figure II.8. Wastewater and sludge disposal would be carried out as in Alternative 1, with treated wastewater disposed at an expanded Southeast Sprayfield, and sludge disposal of sludge from T.P. Smith/Southwest plant expanded beyond Phase I capacity of 17.5 mgd occurring either by landspreading adjacent to the T.P. Smith Plant or landspreading at the Airport.

Alternative System 3: Under this alternative a Southeast treatment plant would be constructed to supplement the treatment capacity of the expanded T. P. Smith/Southwest facility. The Southeast plant would serve the growth areas of the Southeast and Northeast. The T.P. Smith/Southwest plant would provide wastewater service to projected growth areas in the Southwest and to the existing service area. Figure II.9 illustrates this alternative. For the T.P. Smith/Southwest facility, the Phase I expansion to 17.5 mgd would provide 0.4 mgd additional capacity beyond year 2000 requirements if flow reduction measures are implemented. Without such measures, the T.P. Smith/Southwest plant would require an increase of 1.4 mgd capacity in addition to the Phase I expansion. Wastewater effluent would be disposed at the expanded Southeast Sprayfield. Sludge disposal is anticipated to take place either by landspreading adjacent to the proposed treatment plants in the Southwest and Southeast or by landspreading at the Airport site.

8. NO-FEDERAL-ACTION ALTERNATIVE

The No-Federal-Action Alternative is the baseline for evaluating environmental impacts of the proposed structural alternatives. It represents how existing conditions would be altered in the future by local development pressures in the absence of federal investment. Analysis of the No-Federal-Action Alternative shows continued growth in the area if publicly-owned and funded sewage treatment facilities are not constructed. This growth would take place in response to previously committed investments and continuing pressures for new residential construction that would be accommodated in large part either by hook up to existing system, individual on-site treatment systems, or by privately-owned package plants. Thus, "no-federal-action" does not imply "no growth". The major differences between the no-federal-action alternative and any of the structural alternatives will be the density of development, the viability of some of the private real estate developments in the area, and the total and individual costs of wastewater management. Differences in impacts on the natural environment can also be expected under the funding and no-federal-funding alternatives.

It is difficult to predict the changes in development patterns that might occur if no federal grants are used to support wastewater facilities construction. The following assumptions will, however, help define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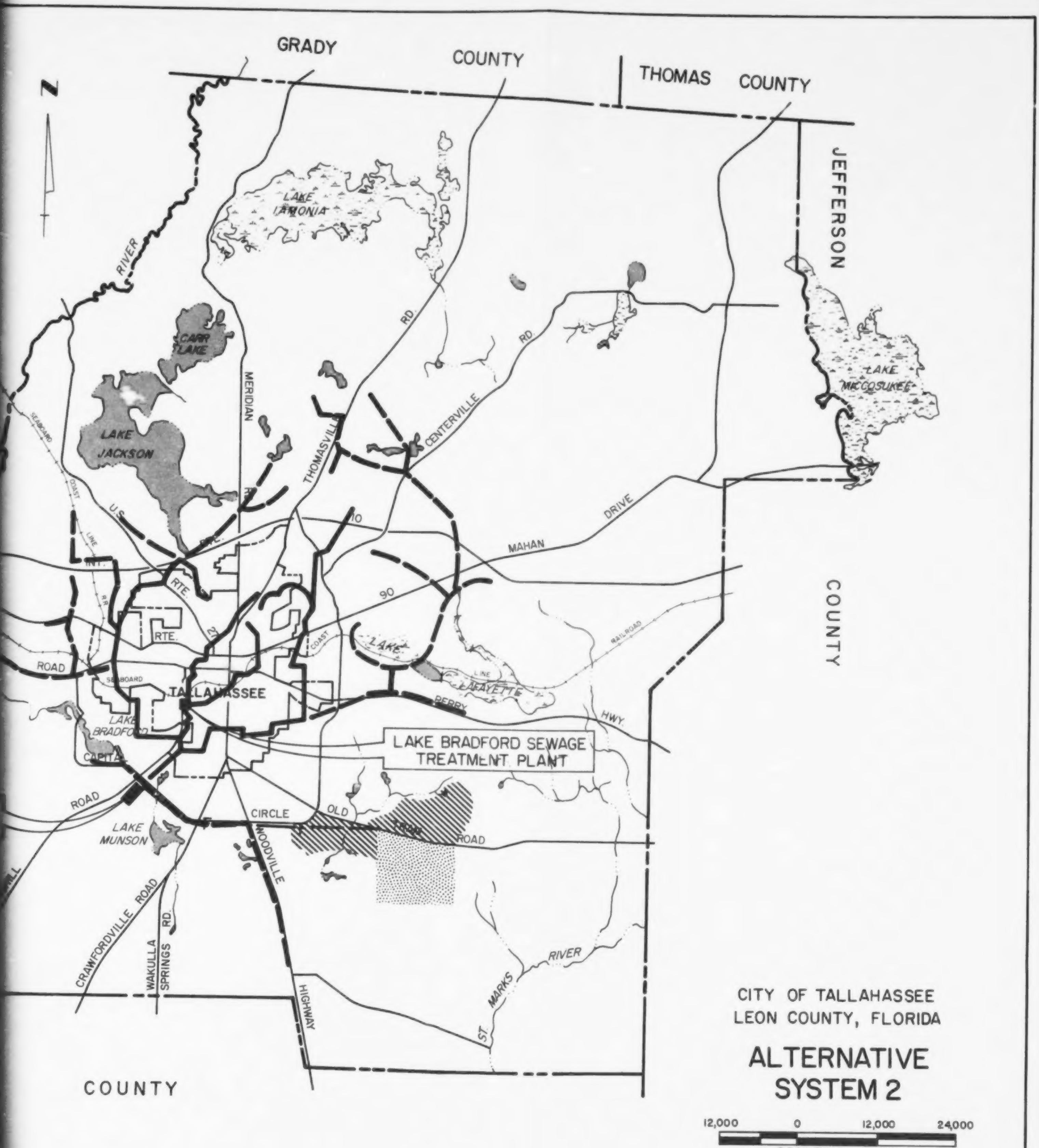
SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP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CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

ALTERNATIVE SYSTEM 2

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
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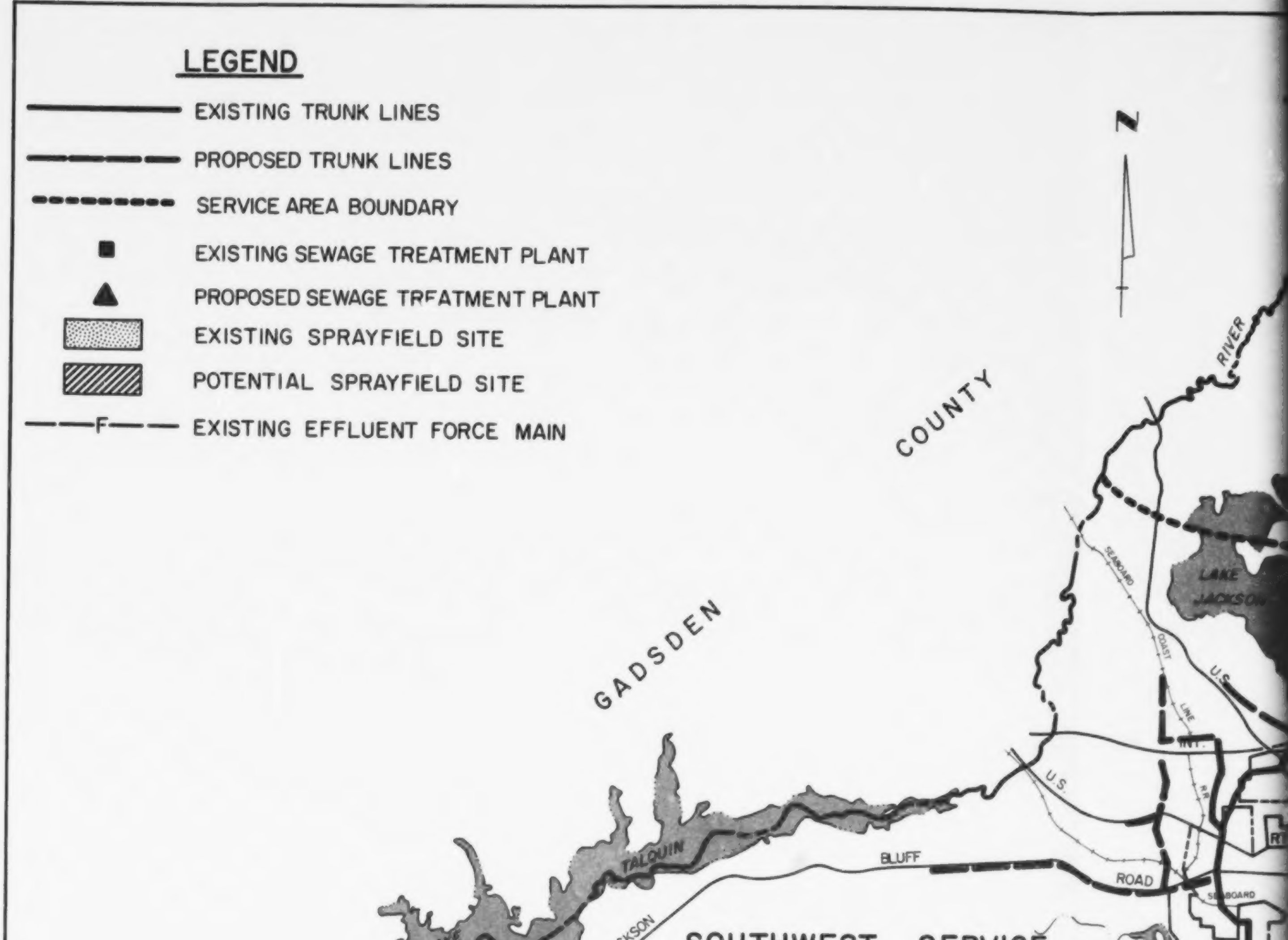
FIGURE II.8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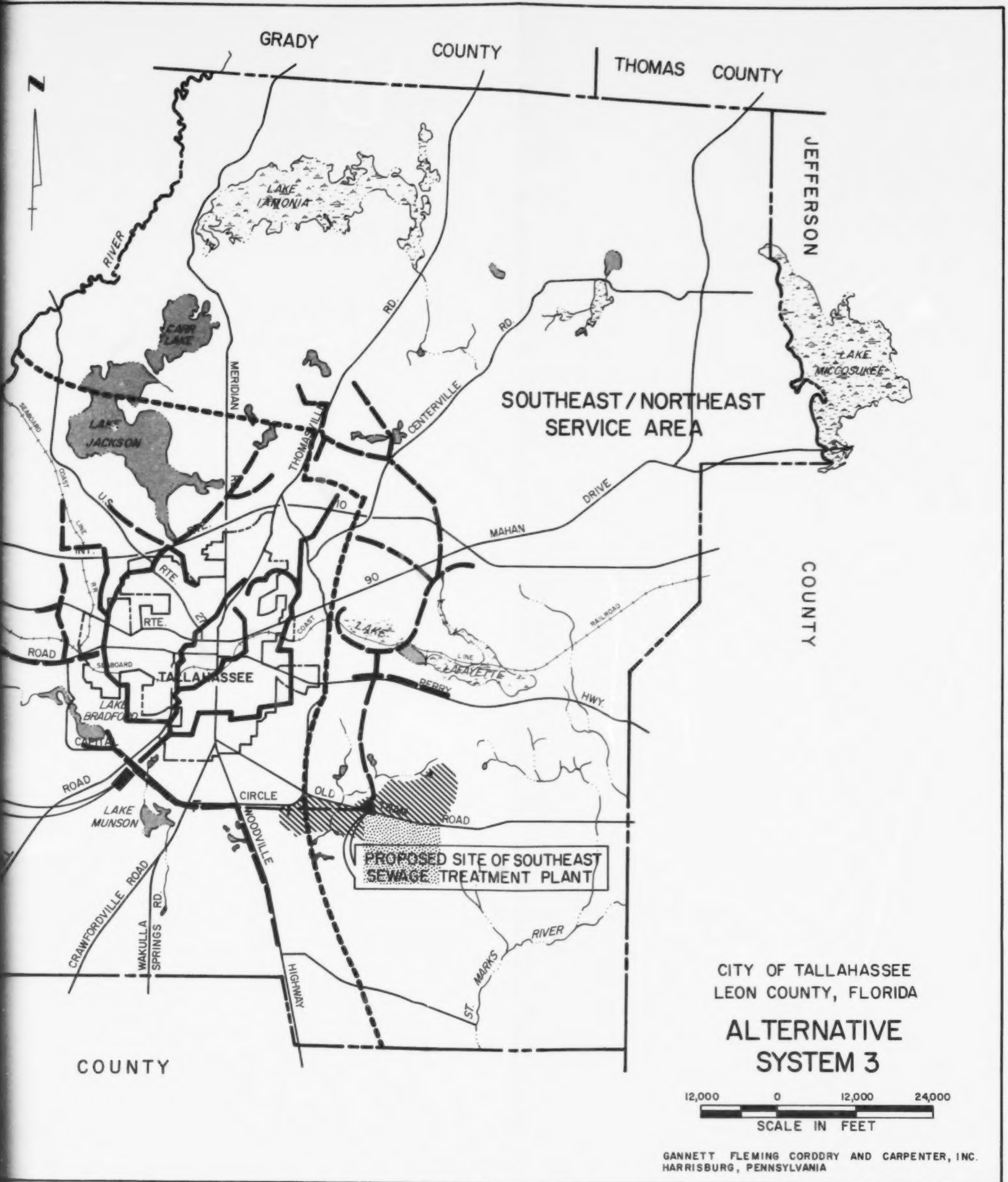
SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP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TALLAHASSEE
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CAPITAL CIRCLE ROAD
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OLD TRAM ROAD
WOODVILLE HIGHWAY
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
ST. MARKS RIVER
PROPOSED SITE OF SOUTHEAST SEWAGE TREATMENT PLANT
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SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

ALTERNATIVE SYSTEM 3

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
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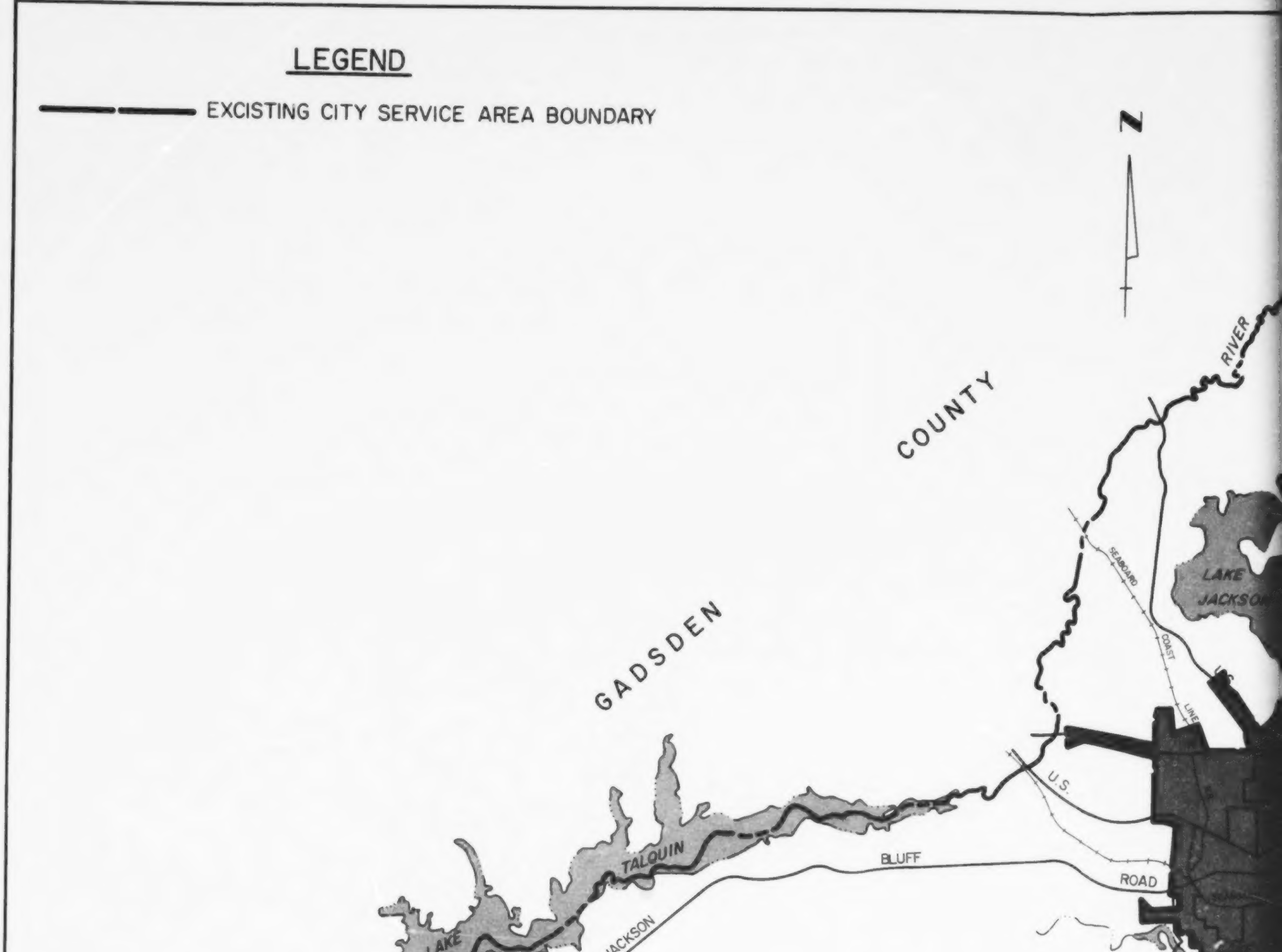
FIGURE II.9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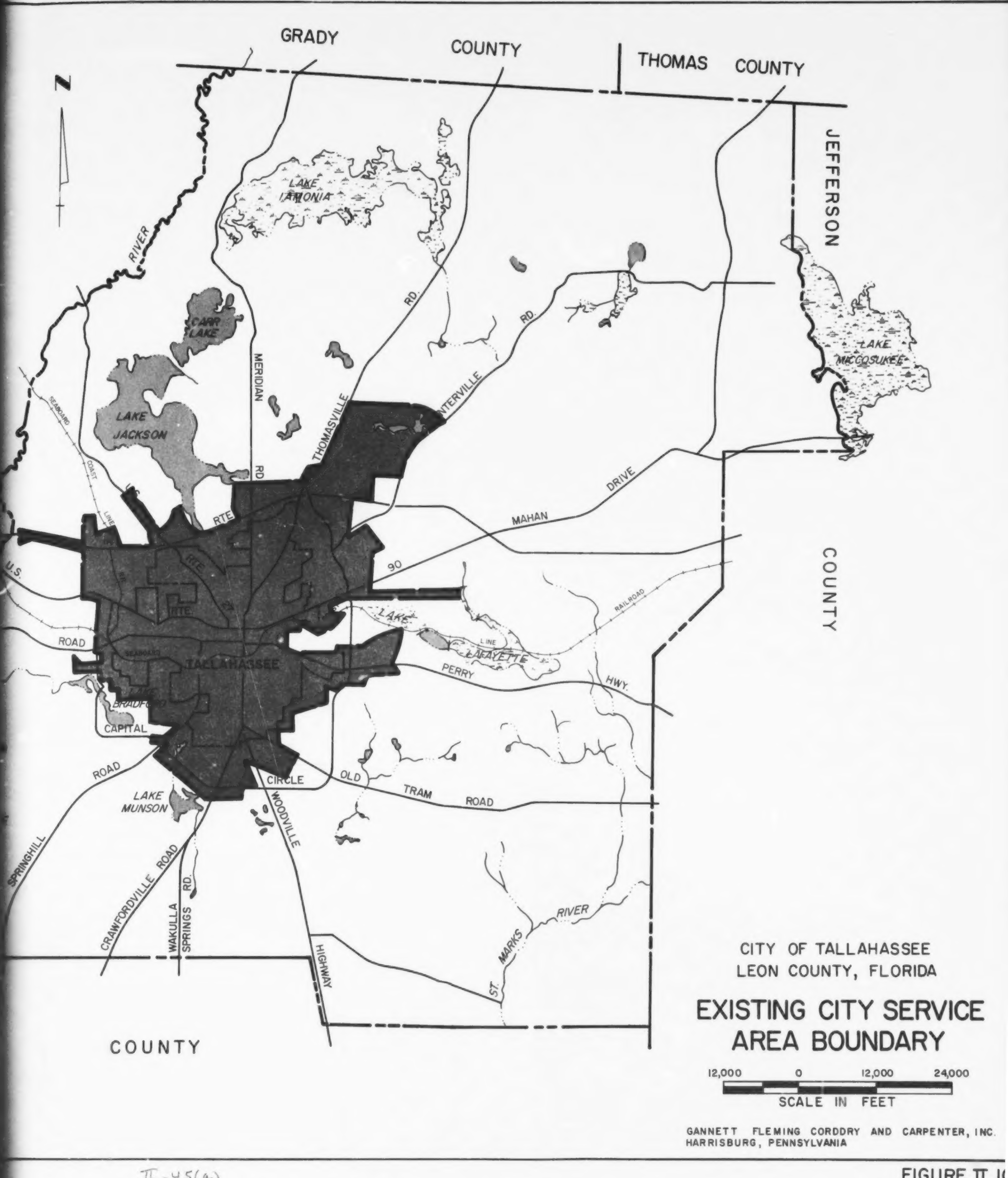
SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP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CRAWFORDVILLE ROAD
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ST. MARKS RIVER
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SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

EXISTING CITY SERVICE AREA BOUNDARY

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

II-45(a)

FIGURE II.1

the development framework sufficiently to permit an analysis of costs and impacts associated with the No-Federal-Action Alternative:

1. The City will not independently finance treatment capacity beyond the 17.5-mgd capacity of the T. P. Smith/Southwest facility currently authorized for Federal participation.

2. The Lake Bradford and Dale Mabry facilities will be closed.

3. The City would construct interceptors in selected unsewered areas until they reach the capacity limitation of the T.P. Smith/Southwest facility.

4. Areas not served by the City would remain or be developed with on-site or small community disposal systems depending upon the suitability of the area. Development densities will be limited to three units per acre.

Under these assumptions, development pressure is expected to be greatest inside the City's existing service area. Therefore, infilling or redevelopment of depressed areas in the City can be expected to take place during the planning period. Based on population forecasts developed by the Tallahassee - Leon County Planning Department, growth in the existing service area will add approximately 45,000 residents and 35,000 employees to the City's collection system resulting in an additional 5 mgd of wastewater reaching the T.P. Smith/Southwest facility. The existing wastewater service area boundaries of the City of Tallahassee will approximate the limits of the sewered areas under the No-Federal-Action Alternative and are shown on Figure II.10.

An analysis was undertaken to determine currently undeveloped and developed lands and to delineate those areas which could be served by:

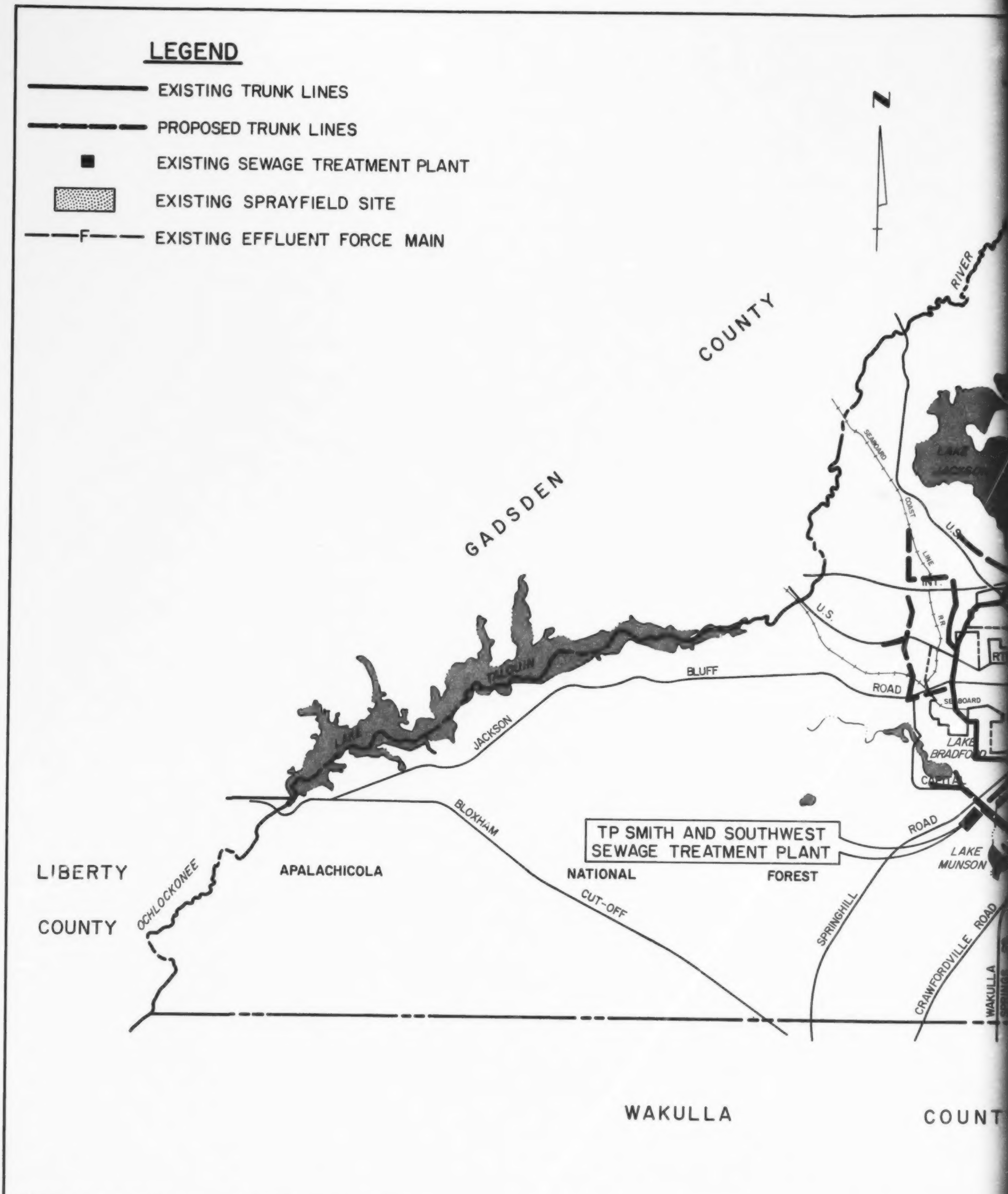
- On-lot disposal systems

- Tap-ons to the existing centralized sewer system

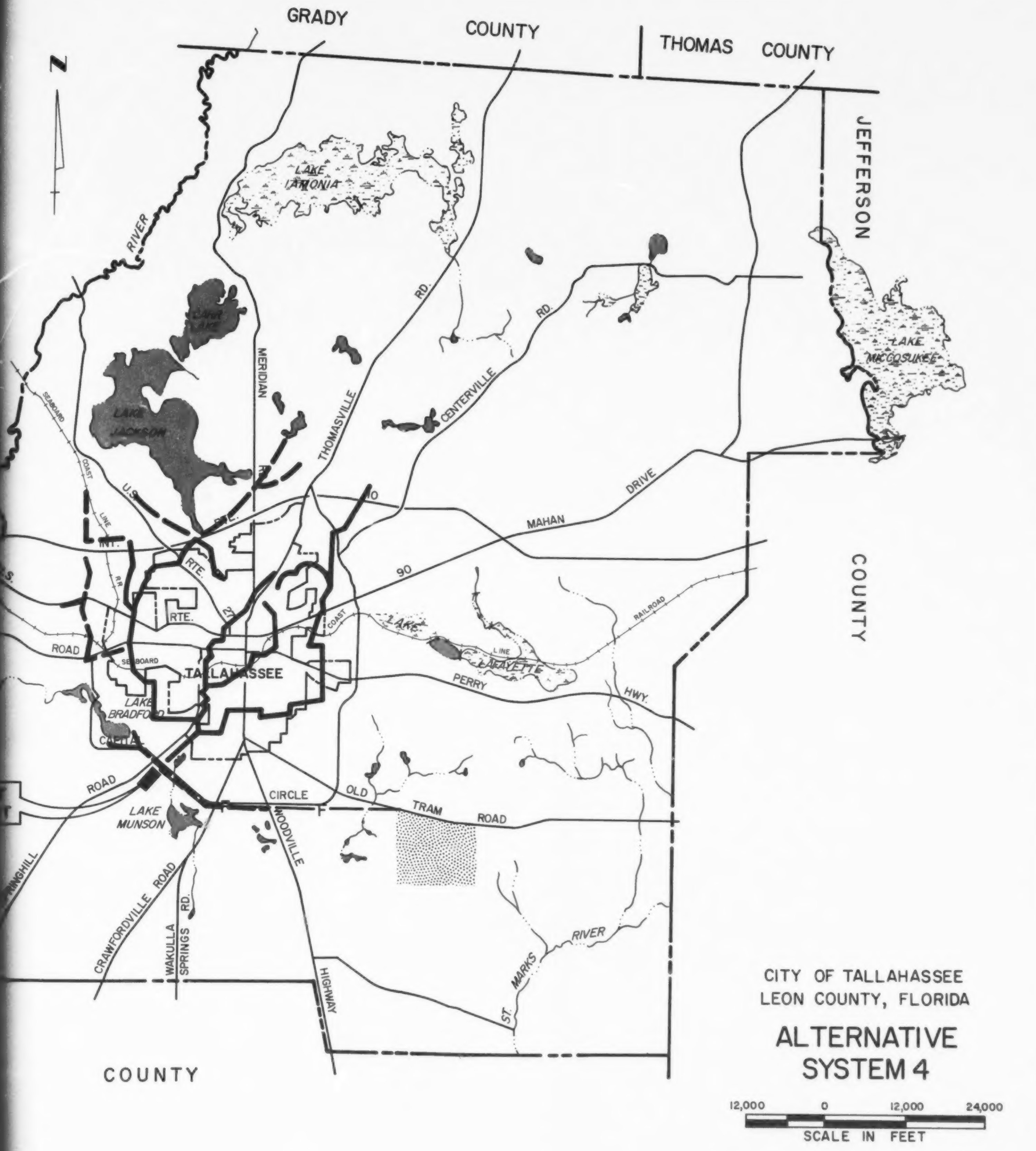
The analysis used a series of maps and overlays incorporating information about land use classes, flood hazard areas, soils suitable for on-lot systems, depth to water table, sewer system area boundaries, and trunk line service area boundaries.

The results of this analysis indicate that the excess capacity in the existing sewer system appears to be adequate to serve future infilling population. Constraints in areas just south of Meginnis Arm and neighborhoods north of Centerville Road and east of Meridian Road will be relieved by a construction program currently underway. Some extension of the existing interceptors would be necessary to connect the infilling population within the City's existing service area to the existing system. The proposed Southwest collection system less the line which extends west along Jackson Bluff Road and the line which extends south along the Woodville Highway, would satisfy these potential needs.

Alternative 4 is illustrated on Figure II.11.


LEGEND
EXISTING TRUNK LINES
PROPOSED TRUNK LINES
■ EXISTING SEWAGE TREATMENT PLANT
▨ EXISTING SPRAYFIELD SITE
—F— EXISTING EFFLUENT FORCE MAIN
N
GADSDEN COUNTY
RIVER
LAKE JACKSON
SEABOARD COAST LINE
U.S.
INT.
RR
U.S.
LAKE TALQUIN
BLUFF ROAD
JACKSON
SEABOARD
LAKE BRADFORD
CAPITA
BLOXHAM CUT-OFF
ROAD
TP SMITH AND SOUTHWEST SEWAGE TREATMENT PLANT
LAKE MUNSON
LIBERTY COUNTY
OCHLOCKONEE
APALACHICOLA NATIONAL FOREST
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA SPRINGS
WAKULLA COUNT

SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP


GRADY COUNTY
THOMAS COUNTY
JEFFERSON COUNTY
COUNTY
N
RIVER
LAKE IAMONIA
CARR LAKE
LAKE JACKSON
LAKE MICCOSUKEE
MERIDIAN RD.
THOMASVILLE RD.
CENTERVILLE RD.
MAHAN DRIVE
U.S. RTE. 27
INT. 10
U.S. 90
RTE.
ROAD
SEABOARD COAST LINE R.R.
SEABOARD
COAST LINE RAILROAD
TALLAHASSEE
LAKE BRADFORD
CAPITAL CIRCLE
ROAD
LAKE LAFAYETTE
PERRY HWY.
OLD TRAM ROAD
LAKE MUNSON
WOODVILLE HIGHWAY
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
ST. MARKS RIVER
12,000
0
12,000
24,000
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

ALTERNATIVE SYSTEM 4

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE II.11

PART D. WASTEWATER MANAGEMENT ALTERNATIVES EVALUATION

1. COST EVALUATION

A detailed evaluation of all significant cost components of the alternative wastewater management systems is required in order to perform the comparative cost analyses. Construction, project, and operation and maintenance costs were developed for each management system and incorporated into the net present worth analysis. The present worth analysis establishes a basis for comparison of total costs (capital and annual operating costs) for each of the wastewater management alternatives.

Cost Development

Construction, project, and operation and maintenance costs were developed for all wastewater facilities in each management system. The estimated cost for any alternative is the sum of the costs of wastewater facilities (collection, treatment, and disposal) associated with that alternative. Available local cost data, data from recent similar projects, standard costing sources, and detailed engineering estimates were used in cost development. All costs are trended to 1980, Tallahassee prices.

Present Worth Analysis

The purpose of the present worth analysis is to establish an estimated total cost value of the capital expenditures (project costs) and operating costs of each alternative over the duration of the planning period. In the analysis, dollars spent on construction at the beginning of the planning period are made equivalent to dollars spent on operating costs at the end of the planning period. Thus, the total cost of a project with a high initial capital cost and a low operating cost can be more equitably compared with the cost of a project with a low initial cost but a high operating cost.

The following assumptions formed the basis for the net present worth evaluation:

- The planning period is from 1982 to 2000.
- Expansion of the T.P. Smith/Southwest plant and the land application sites in the Southeast will occur in 1990. All other construction will occur in 1982
- The discount rate is 7.125 percent, as per U.S. EPA Program Requirement Memorandum, PRM-80-1.

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- In accordance with EPA guidelines, allowances are made for salvage values at the end of the planning period. The salvage value of capital projects depreciates linearly over the expected life of the project; the value of the land, however, does not depreciate.

Costs incurred in the past are sunk costs and are not included in the present worth analysis; existing structures and equipment have no salvage value. These costs are the same for all alternatives, and, therefore, do not affect the relative costs of the alternatives.

The total present worth costs for each alternative system are presented in Table II.18. These totals represent the costs for each system implementing landspreading of sludge adjacent to the treatment plant site. The total costs would be slightly less if landspreading at the airport site was implemented. Of the first three structural alternatives, the second, the regional system, is the least expensive. The present worth cost for this alternative, if nonstructural controls are not implemented, is $31.5 million.

Alternative System 1A is the second least expensive structural alternative. The added costs associated with treatment and disposal in the Northeast make this alternative more expensive than the potential regional alternative, 2. Alternative 1B, with conveyance of Northeast plant effluent to the Southeast Sprayfield is considerably more expensive than any other potential alternative. This is due to the large cost of constructing a transmission line from the Northeast to the Southeast.

Alternative System 4, the No-Federal-Action Alternative, is the least expensive of all the alternatives examined. The costs of this system represent the incremental costs that would occur in the study area to the residential/commercial/institutional populations that decide not to or are unable to be provided with centralized sewer service. The costs of Alternative System 4, reflected on Table II.18, assume that the unsewered growth population, which under Alternatives 1-3 would be serviced, would use on-site systems. On-site systems were evaluated in this EIS and found to be the most cost-effective (economically, technically and environmentally) alternative in conjunction with the previously approved centralized collection and treatment system for the study area.

2. ENVIRONMENTAL EVALUATION

The environmental evaluation of alternatives addresses the impacts that could be caused to the natural and manmade environments if each alternative were to be implemented. Impacts can be considered direct or indirect. Direct impacts are those effects which are a consequence of the actual construction and operation of the alternative. Indirect impacts are those effects which are induced by the availability of services provided by each alternative. In addition, impacts may be long term or short term, positive or negative, and range in degree from major to insignificant. This section of the EIS describes environmental impacts, and, in Chapter IV, impacts are evaluated as to their being

TABLE II.18
ALTERNATIVE SYSTEM COSTS, ($x10^6) BREAKDOWN

	Alternative System 1A		Alternative System 1B		Alternative System 2		Alternative System 3		No-Federal- Action Alternative	
	W/FRM	W/O FRM *	W/FRM	W/O FRM	W/FRM	W/O FRM	W/FRM	W/O FRM	W/FRM	W/O FRM
Service Areas	SW/SE		SW/SE		SW/SE/NE		SW		SW/SE/NE	
Component Costs										
Collection[a]	14.8	14.8	14.8	14.8	22.4	22.4	9.3	9.3	7.3[f]	7.3 [f]
Treatment[b]	0.7	3.3	0.7	3.3	2.9	5.5[e]	0.0	1.6	5.9[g]	10.4[g]
Wastewater[c] Disposal	0.3	0.9	0.3	0.9	0.8	1.6	0.0	0.5		
Sludge[d] Disposal (1)	0.5	1.6	0.5	1.6	1.5	2.0	0.0	1.2		
(2)	0.5	1.5	0.5	1.5	1.4	1.9	0.0	1.2		
Sub-total[h]	16.3	20.6	16.3	20.6	27.6	31.5	9.3	12.6	13.2	17.
Service Areas	NE		NE				SE/NE			
Component Costs										
Collection[a]	3.2	3.2	3.2	3.2			14.6	14.6		
Treatment[b]	5.2	6.0	5.2	6.0			8.0	9.8		
Wastewater[c] Disposal	3.4	3.6	20.0	21.5			0.8	1.1		
Sludge[d] Disposal (1)	1.3	1.4	1.3	1.4			1.6	1.9		
(2)	1.3	1.4	1.3	1.4			1.5	1.7		
Sub-total[h]	13.1	14.2	29.7	32.1			25.0	27.4		
Total Cost[h]	29.4	34.8	46.0	52.7	27.6	31.5	34.3	40.0	13.2	17.7

a. Assume SE conveyance system crosses Piney Z; no significant cost savings with FRM
b. Activated sludge treatment; new system in NE and SE, Table II.5.8; in the SW either expand T.P. Smith or maintain Lake Bradford, Figure II.4.4.
c. Figures II.6.5-9; Assume rapid infiltration at NE disposal site. Transmission from NE to SE follows proposed intercepter route, crossing Piney Z.
d. Figure II.7.2; sludge disposal either adjacent to plant (1) or at airport
e. This is the only case in which it is more effective to maintain The Lake Bradford plant along with some expansion of T.P. Smith/Southwest.
f. Includes SW conveyance system less the 12" line which extends along the Woodville Highway and the 8" line which extends west on Jackson Bluff Road.
g. Costs for on-lot systems = # of households on on-lot x $700/household where $700/household is the present worth including salvage value.
h. Totals represent a system which implements land spreading of sludge adjacent to the treatment plant.

* W/FRM = with flow reduction measures
W/O FRM = without flow reduction measures

direct or indirect, short or long term, positive or negative, and as to their degree of significance.

The following discussions describe the more important environmental impacts caused by each alternative. Impacts from wastewater collection systems, wastewater treatment plants, wastewater disposal options, and sludge disposal options are discussed for each of the four alternatives. A detailed treatment of this subject may be found in the Alternatives Evaluation Task Report (EIS, 1980).

ALTERNATIVE 4: NO FURTHER FEDERAL ACTION

Collection System and Treatment Plant

Under this alternative, the T.P. Smith plant would not be expanded nor would a new treatment plant be built in the Northwest or Southeast. However, environmental impacts could be expected from the construction of extensions to the existing collection system, as shown in Figure II.11. The extensions largely serve existing development, and therefore the environmental disruptions are not as severe as under the other alternatives which extend collection lines into the Lake Lafayette wetlands and Northeast service area, impacting an additional area of over 100 acres.

Some sedimentation of streams could occur during laying of collection lines and urban runoff could increase. These water quality problems could affect aquatic ecosystems. Habitat losses and recreation impacts will be modest. Care must still be taken to protect archaeological sites. Temporary traffic disruption can be expected during the laying of collection lines.

The major difference between this alternative and other alternatives is the lack of a collection system in the Northwest service area and Lake Lafayette wetlands area. Over 28,000 persons which would be sewered in Alternatives 1 through 3, will be served by on-site and small community systems under Alternative 4. The significant environmental impacts potentially associated with the widespread use of on-site systems are as follows:

Water Quality: Numerous stream crossings will be avoided and siltation problems minimized since a collection system will not be installed.

Lower density of development can have beneficial water quality effects. Because there will be less impervious surface per developed acre, pollution from urban runoff will be less than under the runoff will be less per acre than under the other alternatives. Water quality problems and flooding should be reduced due to less overland flow of stormwater runoff.

Land Use: Lower density of development will require larger land conversions for a given number of residents than under other alternatives. Thus, for terrestrial ecosystems, more acres of wildlife habitat and open space may be lost, with concurrent impacts on hunting and other forms of recreation. Presently outlying agricultural areas will feel the pressure of urban expansion sooner than under other alternatives, and prime farmlands may be impacted to a greater degree.

Archeological and Historic Resources: Adverse impacts to Canopy roads will be avoided by this alternative, but archaeological resources may be affected by the installation of on-site and community systems.

Economics: The direct economic impacts of this alternative represent a shift in job opportunities from the laying of collection lines to the installation of on-site systems.

Community Services and Facilities: Lower development densities can lead to the high public costs of urban sprawl. Furnishing community services and facilities to a given population will require more miles of roads, longer utility runs, more police, more fire stations and personnel, and higher energy consumption and transportation costs.

Watewater Disposal

Under Alternative 4 effluent disposal would be handled by a variety of on-site systems relying largely on subsurface drainfields and/or sand-mounds. Rather than concentrating the pollutant load at one or two sprayfields, this alternative, in effect, spreads the load throughout the area. Therefore, on an areawide basis adverse environmental impacts may be less severe than they would be under Alternative 1 through 3. On a localized basis, however, malfunctioning on-site disposal systems can have the following significant impacts.

Odors: Areas of malfunctioning on-site systems could cause odor problems.

Surface Water Quality: Failure by local zoning officials to prohibit the use of on-site systems on lands marginally suitable for development could result in pollution of nearby streams and wetlands. Failure by the Leon County Health Department to strictly enforce siting and installation standards could lead to system malfunctions and runoff to nearby surface water bodies.

Groundwater Quality: If on-site systems are installed in karstic areas or in areas without adequate depth to the water table, pollution of groundwaters could occur.

Aquatic Ecosystems: Runoff from malfunctioning systems to surface water bodies could adversely impact aquatic ecosystems.

Public Health: Areas of malfunctioning on-site systems could constitute a public health risk because of the potential for human contact.

Sludge Disposal

Septic tanks must be pumped out on a routine basis every four to eight years by commercial operators and settled solids trucked to an authorized disposal site. On-site adverse environmental impacts are generally a result of homeowners failing to have performed such routine maintenance. The negative impacts of this type of mismanagement are generally those mentioned above under "Wastewater Disposal."

ALTERNATIVE IA AND B: T.P. SMITH/SOUTHWEST AND NORTHEAST PLANTS

Surface Water Quality: Surface water quality could suffer major adverse impacts due to sedimentation of up to 15 streams during construction of collection systems. Areas of concern in the Northeast urban area include the Lake Lafayette wetlands area, Piney-Z Lake, and Alford Arm, and Gum Swamp in the southwest. During operation of the system, leakage of raw sewage might result in nutrient, organic or bacterial pollution. Major adverse indirect impacts could occur due to increases in urban runoff from development induced by sewer system availability. Runoff might contain fecal and coliform bacteria, sediment, fertilizers, pesticides, herbicides, organics, oil, grease, and heavy metals.

Surface Water Quantity: A long term increase in surface water quantity and/or flooding could occur due to increased runoff from impervious surfaces unless adequate site retention facilities are constructed.

Aquatic Ecosystems: The impacts to water quality can be expected to have adverse impacts on aquatic ecosystems as well. Habitat and food supply may be reduced or destroyed. Toxic effects may cause fish kills or reduce reproductive capacity. The Environmental Monitoring Program Segment I task report (EIS 1980) has already documented the existing degradation of water quality and aquatic communities and habitat.

Terrestrial Ecosystems: The installation of a 323,000 foot collection system is expected to result in the disturbance of 370-380 acres of terrestrial ecosystem habitat, while the Northeast plant site will require the permanent dedication of additional acreage. This loss could impact wildlife and vegetation resources, including habitat for threatened and endangered species. Secondary development will result in further alterations to terrestrial ecosystems.

Land Use: The availability of collection systems in the Northeast area will tend to cause higher density development and concentrate commercial and residential land uses along sewer lines. Forestry and open space uses will be displaced from those areas.

Economics: The direct economic impact of the collection system and new plant is increased jobs in the construction sector.

Population: In the Tallahassee urban area, population growth and economic growth will be induced by the presence of state government employment opportunities and the expansion of the two major universities, rather than by the provision of wastewater management systems.

Historic and Archeological Resources: Construction of collection systems can adversely impact Canopy Roads and prehistoric sites. Induced development can have similar impacts particularly since the area above the Cody Escarpment is thought to be rich in archeological resources, although these resources are not well documented.

Recreation: Recreation and open space resources will be adversely impacted by loss of hunting habitat due to development. Fishing and water contact sports opportunities could be reduced if water quality degradation occurs due to construction impacts or increased urban runoff.

Transportation: Temporary disruption of traffic during the laying of collection systems can be expected. Increases in traffic congestion in Northeast neighborhoods is possible due to induced development. In addition to transportation systems, all community services and facilities will experience increased demands as population grows.

Wastewater Disposal Options (Alt. 1A)

Initially a 260-acre sprayfield was thought to be required for effluent disposal by slow rate spraying methods. Figure II.12 shows the nine tracts which were surveyed for this purpose. Potential significant environmental impacts are as follows:

Noise: Nearby residential areas could be affected by noise from clearing and construction activities at sites B, G, and H.

Surface Water Quality: Effluent could drain into streams, ponds, or wetlands if proper engineering standards and operating procedures are not met.

Public Health: Possible ground water contamination could adversely affect drinking water in wells or residents living near sites B, C, G, and H.

Terrestrial Ecosystems: Tracts range in size from 360 acres (Site F) to 1,760 acres (Site G). With proper planning, the 260 acres required for spray irrigation can be located in the least environmentally sensitive areas. An effort should be made to avoid impacting mixed hardwood areas, oak-hickory forest, mature stands of pine and other habitats for locally threatened and endangered species. The largest losses would be sustained at sites A, B, E, and F. However, large amounts of open land are found at sites C, D, G, H, and I. Wetlands at the surveyed sites can also be avoided. Losses of wildlife habitat will be variable depending upon the type of land developed for the sprayfield.

Aquatic Ecosystems: If systems malfunction, aquatic ecosystems could be adversely impacted at all sites except I, which has no nearby wetlands.

Land Use: All sites represent a conversion from agricultural/forestry uses to croplands. Scattered residential sites are found within sites G and H.

Public Health: The most recent literature indicates that public health impacts are negligible from spray irrigation of secondary treated effluent, given proper design and operation. This was documented in the Alternatives Evaluation task report (EIS 1980).

One of the issues which instigated the EIS was concern for public health risks associated with land disposal of treated wastewater on the proposed Southwest sprayfield site. A study addressing impacts of aerosols and viruses at the Southwest sprayfield was to be conducted if a Southwest sprayfield was incorporated into any of the proposed alternatives. As the Southwest Sprayfield was not found to be needed, no aerosol and virus studies were authorized by EPA.

Archaeological and Historic Resources: Adverse impacts could occur to and previously undisturbed prehistoric sites.

Recreation: The 260-acre spray field represents a loss of hunting areas.

A comparison among the nine sites showed that site I was the least environmentally sensitive, and it became the selected site. It is a 440-acre tract containing 348 acres of open land and no streams or wetlands whose water quality could be adversely impacted. There is low potential for disturbing the habitat of threatened or endangered species. Impacts to the manmade environment are roughly equivalent to those of the other eight sites.

Rapid infiltration was also evaluated and became the preferred disposal methodology for a Northeast effluent disposal site. Major and significant potential adverse impacts associated with the use of this technology at site I are as follows:

Soils: Soils may clog due to suspended solids in the effluent and treatment and disposal efficiencies may be impaired.

Groundwater Quality: Potential exists for groundwater contamination if pollutant removal capabilities are not adequate. Solution channels could develop in areas underlain by limestone. Groundwater levels could rise over time; the decrease in the depth to water table could allow effluent to enter the groundwater before being fully renovated.

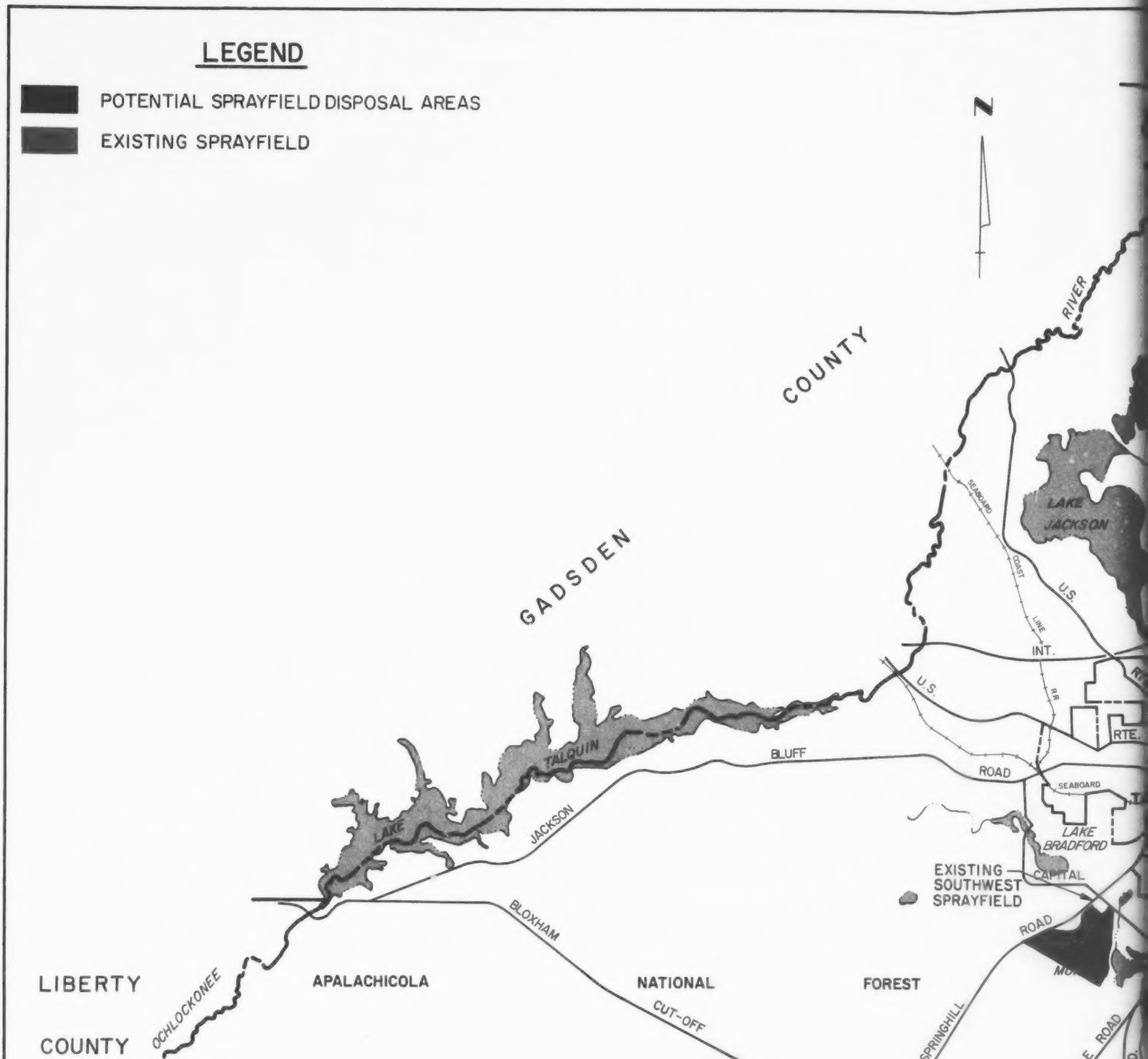
Terrestrial Ecosystems: Rapid infiltration methods require 30 acres per mgd of treated effluent, whereas slow rate methods require 120 acres per mgd. This reduction in demand for land has the beneficial effect of reducing losses of terrestrial habit, open space, and hunting lands. Fewer archaeological sites are disturbed.

Natural Resources Use: Any potential recycling of nutrients or benefits of growing crops are lost.

Wastewater Disposal Options (Alt. 1B)

Wastewater would be treated at the Northeast plant and pumped to the expanded Southeast sprayfield for disposal by slow rate application methods. A maximum of 215 acres would be required within the 1,300 acres at site 3 (west) or the 1,700 acres at site 4 (north) which are shown on Figure II.12.

Surface Water Quality: The construction of a force main from the Northeast plant to the Southeast sprayfield could cause sedimentation at stream crossings, and potential exists for leaks to contaminate surface water. At the sprayfield, potential exists for runoff into nearby surface waters of pollutants not taken up by crops or bound by the soil.


LEGEND
■ POTENTIAL SPRAYFIELD DISPOSAL AREAS
▨ EXISTING SPRAYFIELD
N
GADSDEN COUNTY
RIVER
LAKE JACKSON
SEABOARD COAST LINE RR
U.S.
INT.
U.S.
RTE.
BLUFF ROAD
SEABOARD
LAKE TALQUIN
JACKSON
LAKE BRADFORD
EXISTING SOUTHWEST SPRAYFIELD
CAPITAL ROAD
BLOXHAM CUT-OFF
LIBERTY COUNTY
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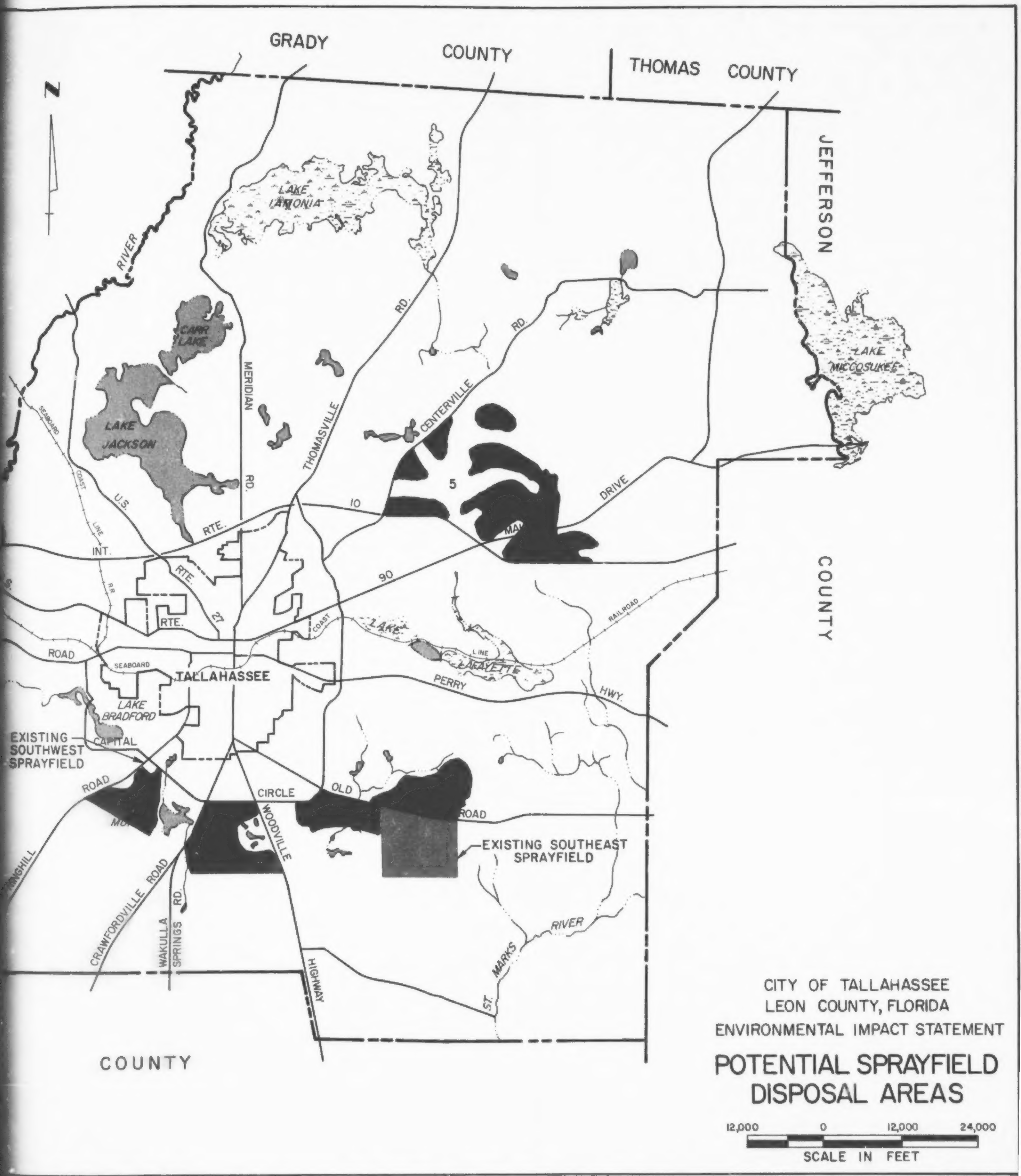
APALACHICOLA NATIONAL FOREST
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
WAKULLA COUNTY

SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP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THOMASVILLE
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CENTERVILLE
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RTE.
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LAFAYETTE
RAILROAD
TALLAHASSEE
PERRY
HWY.
LAKE BRADFORD
EXISTING SOUTHWEST SPRAYFIELD
CAPITAL
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CIRCLE
OLD
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EXISTING SOUTHEAST SPRAYFIELD
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
HIGHWAY
ST. MARKS RIVER
12,000
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24,000
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA
ENVIRONMENTAL IMPACT STATEMENT

POTENTIAL SPRAYFIELD DISPOSAL AREAS

FIGURE II.12

Inadequate agricultural management could result in sediment, herbicide and pesticide runoff. Aquatic ecosystems would be adversely impacted.

Groundwater Quality: Groundwater contamination is possible due to karst areas which underlie much of the southern portion of Leon County.

Terrestrial Ecosystems: At site 3, the 98 acres of long leaf pine/scrub oak/wiregrass plant communities should be avoided due to the sensitivity of wiregrass to disturbances and its potential for protected wildlife habitat. At site 4, 128 acres of mixed hardwoods and 102 acres of oak-hickory forest should be avoided since they serve as habitat for several protected plants. With proper planning the 215 acres needed for spray irrigation can be located in the least environmentally sensitive areas.

Terrestrial habitats in and adjacent to the force main corridor may suffer temporary disturbance during installation of the line.

Land Use: At site 3, pine plantations will be converted to cropland. At site 4, pine plantations and pasture areas will be converted to cropland.

Public Health: The most recent literature indicates that public health impacts are negligible from spray irrigation of secondary treated effluent, given proper design and operation. This was documented in the Alternatives Evaluation task report (EIS 1980).

Recreation: Development of site 3 represents a loss of wild turkey hunting area, while site 4 is low in recreation use and value.

Sludge Disposal Options

Preferred alternatives for sludge disposal consist of landspreading at sites adjacent to the Northeast plant (Alt. 1A), the Southeast plant (Alt. 1B) and the T.P. Smith/Southwest plant or Airport (Alts. 1A and B). Potential significant impacts are as follows:

Odor: Odor problems can arise if the sludge is not properly stablilized and incorporated into the soil. Problems with odors from stored sludge are also possible.

Soil: Low pH in soils throughout the study area could result in uptake of heavy metals (especially cadmium) by plants. At the Southwest site, excess seepage rates will require lining of the liquid sludge holding ponds. The same problem is found at the Southeast site to a greater degree.

Surface Water Quality: Possible impacts can occur from runoff of 1) pollutants not taken up by crops or bound by the soil, or 2) agricultural chemicals or sediment.

Aquatic Ecosystems: Runoff from disposal sites could adversely impact aquatic ecosystems either through heavy metal toxicity or nutrient enrichment.

Terrestrial Ecosystems: Losses of plant and wildlife habitats are variable depending upon the selected application rate and amount of land converted. Impacts to threatened and endangered species can be avoided by careful selection of sites.

ALTERNATIVE 2: T.P. SMITH/SOUTHWEST REGIONAL SYSTEM

Collection System and Treatment Plant

The types of environmental impacts are basically the same as described for Alternative 1A and B, although in some cases they differ in degree and location. The T.P. Smith plant will be expanded, but such construction will not have as severe environmental impacts as will the construction of new plants under Alternatives 1A, 1B, and 3.

Wastewater Disposal Options

The preferred disposal alternative is the use of slow rate infiltration at the Southeast sprayfield expansion site. The environmental impacts of this option were discussed under the description of Alternative 1B.

Sludge Disposal Options

All sludge would be disposed by landspreading at a site near the T.P. Smith/Southwest plant or at the Airport. Impacts are the same as those discussed for Alternative 1A and B.

ALTERNATIVE 3: T.P. SMITH/SOUTHWEST AND SOUTHEAST PLANTS

Collection System and Treatment Plant

The types of environmental impacts are basically the same as described for Alternative 1A and B. A site-specific difference is the fact that for Alternative 3 a collection line runs south from the Lake Lafayette wetlands area to the Southeast plant, impacting an area not affected by Alternatives 1A and 2. (The Alternative 1B effluent disposal line to the Southeast sprayfield follows the same route). Under this alternative more land is disturbed by the collection system and three more streams are crossed than under other alternatives. An additional 7,000 feet of collector systems will be built under this alternative.

Wastewater Disposal Options

The preferred disposal alternative is the use of slow rate infiltration at the Southeast sprayfield expansion site. The environmental impacts of this option were discussed under Alternative 1B.

Sludge Disposal Options

Sludge would be disposed by landspreading at sites near treatment plants in the Southeast and at T.P. Smith/Southwest or the Airport. The impacts are the same as those discussed for Alternative 1.

3. TECHNICAL AND INSTITUTIONAL FEASIBILITY

The technical feasibility of each wastewater management alternative has been evaluated in terms of installation, construction, and operation and maintenance. Table II.19 shows the major potential installation and operation problems with recommended components of the wastewater management alternatives.

The feasibility of installing or constructing any of the alternatives depends on ease of installation or construction, availability of materials, and availability of manpower experienced in working with the structural facilities associated with each alternative. None of the alternatives has any severe technical constraints in terms of installation or construction. Septic tanks, sewers, extended aeration treatment plants for small communities, an activated sludge treatment plant, and spray irrigation and sludge spreading systems are already being utilized within the study area. The rapid infiltration disposal system recommended for possible use in the Northeast has only been used in the study area on an experimental basis. However, because this disposal system is similar to a stabilization pond, in terms of construction and installation, the fact that one has never been constructed in the study area before cannot be considered a severe technical constraint.

Operation and maintenance characteristics have been broken down into the following criteria: reliability, flexibility, and ease of operation and maintenance for both the homeowner and the managing agency of public systems. The reliability of a wastewater management system is reflected in its ability to consistently achieve and maintain water quality and other environmental goals for which it is intended with a minimum of operational problems. The flexibility of an alternative is measured in terms of its capability to adapt to higher future wastewater flows and its ability to comply with future changes in water quality goals. For example, an activated sludge system has the ability to accept higher flows and still achieve the desired treatment performance. The ease of operation and maintenance of an alternative must be considered in terms of the amount of attention required to maintain the desired reliability.

The comparison of the technical feasibility of the four alternatives can be reduced to a comparison of the technical feasibility of a centralized wastewater management system (Alternatives 1-3) vs. a decentralized wastewater management system (Alternative 4). Table II.20 summarizes a comparison of a centralized system vs. on-site systems. Small community systems, part of a decentralized system, are subject to many of the problems associated with the components of a centralized system in addition to the management problems which come with being decentralized.

As mentioned before, there are no severe technical constraints associated with installation or construction of a centralized plant and collection system or a decentralized system. Care must be taken in the selection of sites for wastewater disposal, sludge disposal, and on-site systems; site selection is of greater concern in a decentralized wastewater management system.

A centralized system appears to present the least amount of O&M problems because of the well-defined responsibility and the centralized

TABLE II.19
POTENTIAL INSTALLATION AND OPERATION PROBLEMS
WITH RECOMMENDED MUNICIPAL WASTEWATER MANAGEMENT SYSTEMS

Type of System	Concerns with Installation and Performance
Interceptor Sewers	- Obtaining rights-of-way prior to installation - Anaerobic conditions if wastewater is within a sewer for a long period of time - Possible surface water degradation resulting from construction-related soil erosion
Activated sludge treatment of wastewater	- Disruption of microorganism activity due to sudden, shock loadings or flows entering aeration basins
Wastewater disposal by rapid infiltration	- Lack of local familiarity with operation procedures - More attention needed for proper maintenance of inundation basins - Performance reliability highly dependent on physical, chemical and biological constituents found in soil profile
Sludge treatment	
a) Anaerobic digestion	- Performance is susceptible to changes in loadings, flows, and temperature
b) Vacuum filtration	- Performance may vary with digested sludge characteristics
Sludge disposal by landspreading	- Uncertainty of knowing precipitation patterns immediately following a landspreading effort
Wastewater disposal by slow rate	- Performance reliability highly dependent on physical, chemical and biological constituents found in soil profile

TABLE II.20
SUMMARY OF THE TECHNICAL FEASIBILITY OF CENTRALIZED VS. ON-SITE SYSTEMS

	Centralized Plant(1) and Collection System	On-Site Systems (2)
Installation and Construction	. Expertise is available. . Terrain will not be a problem. . No severe technical restraints.	. Expertise is available. . Attention to site characteristics necessary; sites or systems may require some modification.
Operation and Maintenance (O&M)	. Reliability good if well trained staff maintained. . Flexibility, in a well-designed system, will not be a problem. . System may possibly be complex and difficult to operate and maintain, if unfamiliar with operation.	. Reliability may be a problem particularly with individual responsible for each system. . Flexibility problems possible in that the systems must be tailored to local conditions. . Simple system to operate and maintain.

(1) Alternatives 1, 2, and 3 complete; areas within the City's service area boundaries

(2) Growth Areas of Alternative 4

nature of collection and treatment systems. Alternative 4 is characterized by a substantial number of on-site and small community systems dispersed over a large geographical area, which leads to a decentralized and somewhat less defined management responsibility.

As shown on Table II.19, the majority of operation and maintenance concerns with municipal wastewater management systems deal with the reliability of the systems under uncertain conditions. For example, in the activated sludge treatment of wastewater the microorganism activity can be disrupted by sudden, shock loadings or flows entering aeration basins or in landspreading of sludge an unexpected heavy rain immediately following a landspreading effort may cause excessive runoff. These problems can be managed, however, by providing and maintaining a well-trained staff or operation and maintenance personnel.

Wastewater management under Alternative 4 leaves the responsibility for proper operation of disposal systems to thousands of individuals. In order to improve the reliability of a decentralized system, the possibility of a Tallahassee-Leon County agency, similar to the jointly operated Tallahassee-Leon County Planning Department, should be investigated. This agency would assume responsibility for the management of these small systems and could have a variety of functions:

1. Inventory and review of existing alternative systems
2. Planning including evaluation of alternative systems for individual communities and guidelines for site evaluation, design and installation
3. Involvement with operation and maintenance such as homeowner notification and approval of maintenance experts
4. Financing clearinghouse
5. Water quality monitoring
6. Public education
7. Coordination with related programs
8. Stockpiling of replacement parts

From a planning point of view the decentralized system has less flexibility due to limitations of soils within parts of the study area. Alternatives 1, 2, and 3 can be tailored to the needs of the community, whereas Alternative 4 is tailored around local conditions. The use of small community systems in the decentralized system will increase its flexibility for planning significantly.

All of the alternatives have good flexibility from a systems point of view. The decentralized system would have greater flexibility for handling higher future wastewater flows because of the large amount of suitable soils in the study area.

In comparing the operating and maintenance characteristics of the four system alternatives, it may seen that wastewater treatment plants are more difficult to operate and maintain than a less complex septic or small community system. However, the individual homeowner has more responsibility in the maintenance of a septic tank, unless the system is taken over and maintained by a managing agency. Thus, it would probably be easier to operate and maintain a centralized sewer system and treatment plant, or plants, than the on-site systems of each customer.

4. IMPLEMENTATION AND MITIGATIVE MEASURES

Introduction

The primary stages of a wastewater management project include:

- Planning and design
- Construction
- Operation of maintenance
- Public acceptance and public agency participation

Within each of these stages, measures can be incorporated which mitigate adverse impacts or enhance beneficial impacts. Most measures discussed in this chapter are mitigative, primarily because they are often financially justifiable and are considered more essential than enhancement measures in terms of implementing an acceptable alternative. This chapter outlines appropriate implementation procedures and how each mitigative measure could be inserted into the procedures. Many of these procedures and measures are common to each of the four alternatives; those which are not are noted as such.

Planning and Design

Once the EIS process is completed, detailed planning and design procedures will commence. Difference types of procedures which will be needed are as follows:

1. For interceptors:
    a. Transit surveys of corridor routes
    b. Planning measures to mitigate impacts of interceptor construction particularly at stream crossings.
    c. Designing interceptors and mitigative measures
    d. Securing contractor services

2. For municipal treatment plants:

   a. Bench-scale treatment process suitability tests

   b. Design of treatment facilities

   c. Purchase of land for treatment plant and effluent storage facilities

Purchasing of additional land will not be needed for treatment plants associated with Alternatives 2 or 4. Auxiliary treatments can be considered mitigative measures. For example, lime treatment further reduces the risk of public health and odor problems with sludges.

3. For wastewater and sludge disposal:

   a. Detailed soils investigations at disposal site(s)

   b. Field tests of new land application or landspreading procedures at existing disposal site(s)

   c. Final selection and layout of disposal site(s)

   d. Purchase of land at disposal site(s)

Soils investigations, site layout and land purchase procedures will be most extensive if wastewater and/or sludge disposal is conducted at one or more sites in the Northeast service area since portions of the Southeast, Southwest and Airport sites have already been utilized for disposal. The site layout procedure will need to include planning of buffer zones and runoff diversions as mitigative measures.

4. For on-site systems:

   a. Development of a management group or other type of association oversee all on-site system activities

   b. Field tests of soils, permeability and other parameters for each lot that is to have an on-site system

   c. Standardization of practices for firms that install on-site systems

Similar planning and design of small community systems is also a possibility. On-site and small community system procedures are particularly important for Alternative 4. Each of the procedures for on-site systems can be considered a mitigative measure.

Construction

Controlled construction procedures primarily inhibit short-term, adverse impacts on vegetation and animal habitats, surface water quality and other aspects of the natural environment. Many of the planning and design measures are carried over into construction procedures. These procedures with inherent mitigative measures are as follows:

1. For interceptors:
   a. Restrictive construction techniques at stream crossings to prevent unnecessary water quality problems and disruption of natural habitats
   b. Control of erosion and runoff potential

The concern with stream crossings applies mostly to Alternatives 1 through 3 which include an interceptor crossing a stream which flows into Piney Z Lake.

2. For disposal sites:
   a. 100 to 200-foot buffers between disposal areas and roads, streams, airport runways and other areas heavily utilized by people
   b. Disturbing sites as little as possible as they are prepared to receive wastewater or sludge, to minimize soil erosion
   c. Runoff controls such as diversions or storage basins to avoid surface water quality impacts
   d. Back-up storage in case a site is not operable; for example, during rainy periods

For other wastewater management structures, inspection of construction activities regulated by codes and government regulations is needed to assure compliance, particularly with regulations for on-site systems.

Operation and Maintenance

In addition to providing transmission capacities and effluent quality specified in designs and controlling disposal activities, other operation and maintenance activities can be specified:

1. Regular inspection and maintenance of on-site and small community systems, particularly if Alternative 4 is implemented.
2. Groundwater and surface water quality monitoring to observe quality changes as a result of disposal activities
3. Special land application operations:
   a. Use of low pressure spray nozzles pointed downward to minimize aerosol drift

   b. Halt spraying during windy periods

   c. Maintain proper crop management techniques to ensure nutrient removals

   d. With rapid infiltration systems, inundation basins must be maintained to break up soil clogging conditions

4. Special sludge application operations:

   a. Set application rate equal to the net evapotranspiration rate to discourage occurrence of surface runoff

   b. Select crops which utilize metals but at the same time do not promote passage of metals directly to humans

Public Acceptance

Public acceptance of wastewater management alternatives will be closely related to costs to homeowners, with public resistance increasing with more expensive alternatives. Inconvenience to homeowners will also be a factor in public acceptance.

The probable reaction of specific groups affected by each alternative may be suggested by examining the particular interests of each group. For example, commercial owners, including apartment and office building owners, will be likely to favor alternatives which remove the responsibility for wastewater disposal from them and place it with a public agency. Cost will probably be a secondary consideration to relief from wastewater treatment problems. Owners of existing package treatment plants will be likely to favor alternatives that will leave their operations intact, while not favoring those alternatives that would curtail their operation. Landowners with interest in residential, commercial, or industrial development will favor the alternatives which most greatly facilitate such development.

Public Agency Actions

City of Tallahassee Department of Underground Utilities: This public agency operates the only municipal wastewater facilities in the study area, and has the responsibility for properly maintaining the wastewater collection, treatment and disposal systems within its service area boundaries. The City of Tallahassee will also play a major part in implementing the recommended alternative of this EIS. As part of that responsibility, the City will engage in siting of facilities, acquiring right-of-ways, negotiating with private landowners for possible land application disposal sites, and possibly be involved in a land swap with the U.S. Forest Service if land in the Apalachicola National Forest is used.

The EIS has investigated the use of flow reduction measures for the study area. If a decision is made to implement such a program, the City must take the lead in establishing the mechanism for distributing these flow reduction devices, along with providing a public education program on the benefits of the plan.

Recommended Small Community System Management Agency: This proposed management agency could fall under the responsibility of several agencies such as the Leon County Health Department or a homeowner's association.

Leon County Public Works Department: The new interlocal agreement between the City of Tallahassee and Leon County will cause this public agency to play a significant role in implementing the recommended alternative system of the EIS. This Department will be the 201 Wastewater Facilities planning and management agency for all areas falling outside the City's service area boundaries. At its option, the Public Works Department will be the operating agency for wastewater facilities that are not City-owned and that lie outside the City's boundaries. This agency is now trying to obtain responsibility for managing and operating several water supply systems owned by Talquin Electric Cooperative (T.E.C.). Similarly, it may eventually take over the responsibility of operating T.E.C. and other privately-owned wastewater systems. This public agency may decide to be the management agency for on-site and other small community systems lying outside the City's service area boundaries. Finally, the Public Works Department may play an important role in establishing a flow reduction program in conjunction with the City of Tallahassee.

Florida Department of Environmental Regulation: The Florida Department of Environmental Regulation (FDER) is the public agency responsible for protecting the environment in the Tallahassee-Leon County study area. With respect to water quality management, the FDER's primary concern is to protect the Floridan Aquifer and surface water resources of the study area. The FDER must also see that an orderly and planned construction of wastewater facilities in the area occurs and that the water quality criteria set for the area are met.

Other Implementation Considerations

Public ownership of small community systems is a distinct possibility under the EIS alternatives. The concept of public ownership of on-site disposal systems, though relatively new, has been applied in some areas of the nation. Under this concept, on-site system management districts are established and operated by a public agency. The public agency many own the on-site disposal systems and is granted an easement by each property owner to allow agency personnel access to the disposal units for maintenance and inspection. Public ownership or control of on-site systems may offer several benefits, including:

1. Initial upgrading of existing units and construction of new units may be carried out with funding under the EPA construction grants program.

2. The public agency carries out a regular inspection and maintenance program, preventing system failures.

The major disadvantage of public ownership of on-site systems is its costs. Acquisition of on-site systems and right-of-way will entail legal and engineering fees. Actual costs of public acquisition and operation of on-site system are difficult to quantify.

CHAPTER III - PREFERRED ALTERNATIVE

PART A. INTRODUCTION

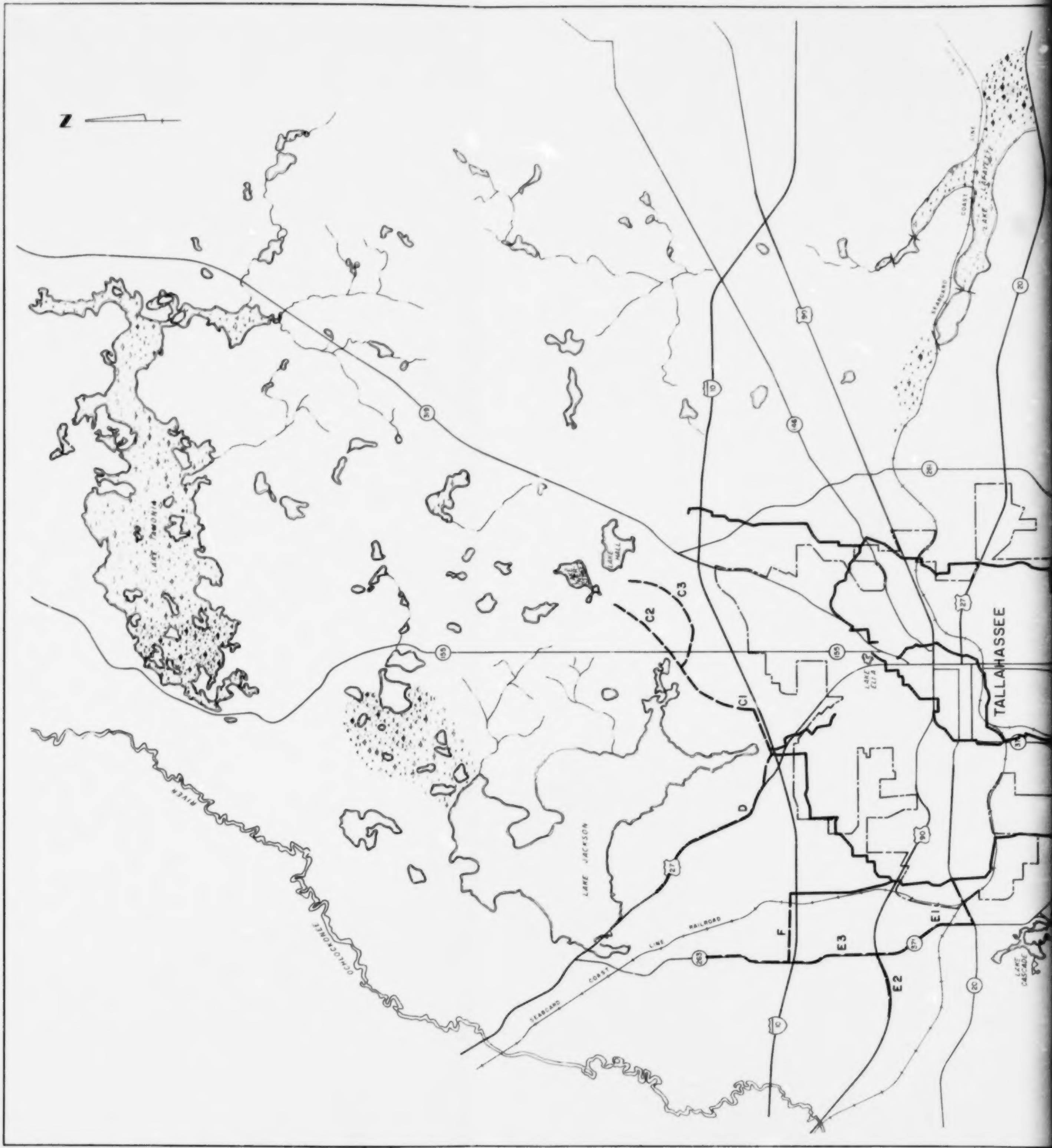
This EIS is the study of the wastewater management needs of the Tallahassee-Leon County 201 planing area. The issues which precipitated the EIS and the proposed 201 Phase II facilities have been considered. The development and evaluation of alternatives for wastewater management in the study area have resulted in the alternatives described in Chapter II.

PART B. SELECTION OF THE PREFERRED ALTERNATIVE

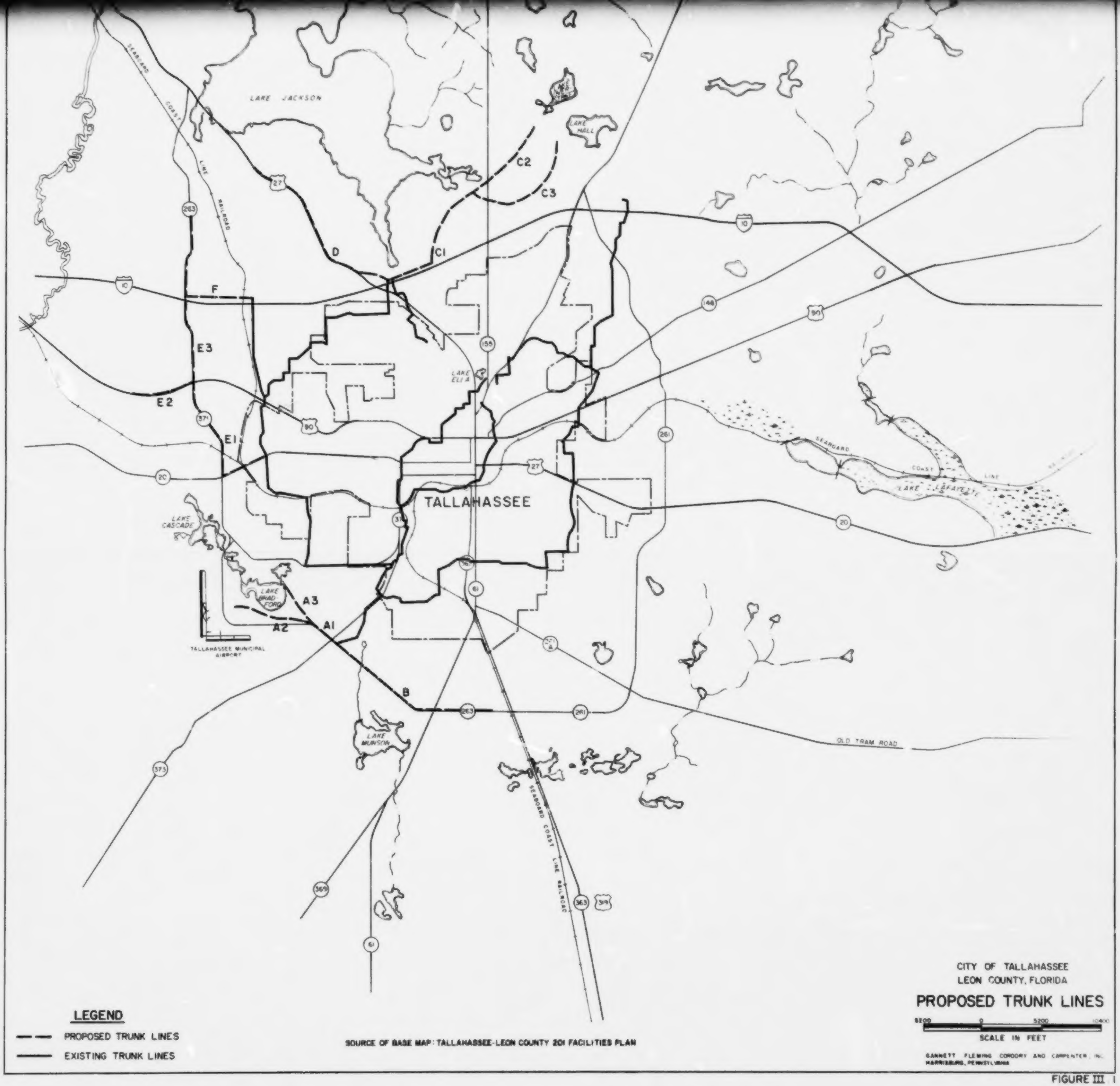
EPA has selected Alternative 4 (No-Federal Action) to be the preferred alternative as the proposed action for the draft EIS. The EIS failed to demonstrate a justified need for the 201 Plan's Phase II facilities represented by the structural alternatives. The remainder of the Phase I facilities which have been approved by EPA will serve all existing and some future needs.

As discussed in Chapter II, no additional centralized treatment capacity is proposed for construction in Alternative 4. Areas within the existing City service area will be served by 201 Plan Phase I construction: expansion of T.P. Smith /Southwest facility to 17.5 mgd, expansion of Southeast sprayfield to 17.5 mgd, and construction of new 17.5 mgd sludge handling facilities. It is projected by the year 2000 the wastewater flow within the area presently served by the City will approximate 17.5 mgd, without considering flow reduction measures. Some extension of the existing interceptors will be necessary to connect the infilling population within the City service area to the existing system. The proposed interceptors are shown on Figure III.1. The location of these lines was determined with the purpose of making the best use of excess capacity in the existing lines, while, at the same time, serving those areas which are unsuitable for on-site systems, are currently served by failing on-site and small community systems, or where high density development is projected for the planning period.

In order to provide the most economical system configuration, the proposed lines were designed to follow natural drainage patterns where land use patterns did not interfere. This allows the use of gravity lines rather than force mains, minimizing the amount of pumping required. The location of existing interceptors also greatly influenced the placement of the proposed lines. Gravity lines were sized assuming peak design flow, minimum slope, and a velocity of at least 2.0 feet per second when flowing full. Force mains were sized according to standard flow charts based on the Hazen-Williams equation for flow through pipes under pressure to maintain a velocity of at least 2.0 feet per second. The type, size, and length of the proposed interceptors are listed in Table III.1.



N
LAKE IAMONIA
LAKE HALL
LAKE ELLA
LAKE JACKSON
LAKE LAFAYETTE
LAKE CASCADE
OCHLOCKONEE RIVER
SEABOARD COAST LINE RAILROAD
SEABOARD COAST LINE
TALLAHASSEE
319
155
10
27
90
20
261
146
263
371
C1
C2
C3
D
E1
E2
E3
F


LAKE JACKSON
LAKE HALL
LAKE ELLA
LAKE CASCADE
LAKE BRADFORD
LAKE MUNSON
LAKE LAFAYETTE
TALLAHASSEE
TALLAHASSEE MUNICIPAL AIRPORT
SEABOARD COAST LINE RAILROAD
OLD TRAM ROAD
A1
A2
A3
B
C1
C2
C3
D
E1
E2
E3
F
10
27
20
90
146
155
261
263
319
363
369
373
61
LEGEND
PROPOSED TRUNK LINES
EXISTING TRUNK LINES
5200
0
5200
10400
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

PROPOSED TRUNK LINES

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

SOURCE OF BASE MAP: TALLAHASSEE-LEON COUNTY 201 FACILITIES PLAN

FIGURE III 1

TABLE III.1
SUMMARY OF PROPOSED TRUNK LINES

Trunk Line	Length (ft)	Diameter (in)	Type of Line	Peak Flow (gpm)	Head Loss (ft)
A1	2500	12	G		
A2	800	8	G		
A3	1000	8	G		
	2500	8	F	340	55
	1100	8	G		
B	5500	15	G		
	2500	18	G		
	3000	14	F	1212	36
	2500	18	G		
	2500	14	F	1295	36
C1	6000	14	F	1270	180
	4000	18	G		
C2	8500	12	G		
C3	8000	8	G		
	2500	10	G		
D	1000	10	F	780	17
	1000	15	G		
	2000	14	F	1030	30
	6200	18	G		
E1	1000	12	G		
	1250	12	F	750	38
	4000	12	G		
	2000	12	F	750	55
	1000	12	G		
	700	12	F	830	17
	3300	15	G		
E2	7000	8	G		
E3	3500	8	F	340	59
	3750	8	G		
F	1250	8	F	340	30
	2750	8	G		
	1750	8	F	340	25
	6000	10	G		

NOTE: For lines consisting of more than one size or type of pipeline, each section of the line is listed starting from the outermost section. For example, the 1250 foot, 8 inch, force main of the F line runs into the 2750 foot, 8 inch, gravity line, and so on.

G - Gravity line
F - Force main

One of the issues which resulted in the preparation of the EIS is that wastewater flow projections in the study area are too high. The 201 Plan projects a wastewater flow of 30.4 mgd by the year 2000. The EIS projects a wastewater flow of 22.3 mgd by the year 2000 for the study area, a difference of 8.1 mgd. Further, should flow reduction measures be utilized, the year 2000 flow would be 19.9 mgd, a difference of 10.5 mgd.

After completion of the Phase I facilities, already approved by EPA, the T. P. smith/Southwest Plant will have a capacity of 17.5 mgd. It is projected by the year 2000 the wastewater flow within the area presently served by the city will approximate 17.5 mgd, without considering flow reduction measures.

The 4.8 mgd of flow (without flow reduction measures) above the 17.5 mgd capacity of the T.P. Smith/Southwest facility is projected to be generated mainly in the northeast and eastern portions of the study area. The EIS has shown these areas to be mostly suitable for the use of on-site and small community systems. This determination of suitability is based on soil types and groundwater conditions. In certain other portions of the study area, interceptor sewers will be constructed, under Phase I facilities, to serve areas where conditions are not suitable for on-site systems, such as the Meginnis Arm area near Lake Jackson.

Data on soils in the growth area support the use of on-site systems. The Leon County Health Department indicates that on-site systems operate properly when their construction follows the basic rules governing their placement. The few failures of on-site systems that have occurred in the northeast growth area are a result of poor siting and poor construction. This is confirmed by personal communication with septic tank installers in the area. In addition, a recent study conducted in Leon County, Florida, to develop soil potential ratings for septic tank absorption fields rated most of the soils in the growth areas as having medium to very high potential for septic tank installation (See Table IV.2).

Future use of on-site systems in the eastern and northeastern areas of Tallahassee should be fully acceptable. The few future problems with on-site systems will predominantly be institutional problems in that pressure will be placed by developers for less stringent rules governing on-site placement and sizing, and existing rules may not be followed. Most of those contacted concerning potential septic tank problems said that one of the most important future needs with respect to septic tank use is a modification of the rules to address problems associated with the increased use of garbage disposals and washing machines.

Another issue of the EIS is that the potential for future development in Leon County is in the Northeast part of the County. Concern was expressed that this development would have adverse impacts on wetlands and streams in this area. The recommended alternative will result in less dense development than with a centralized wastewater system, thus decreasing the potential for nonpoint source pollution and less opportunity to develop floodplains, wetlands, and high-groundwater areas. Also, the primary impacts on wetlands and streams from the construction of interceptors, which would require fifteen stream crossings, would be avoided.

The importance of groundwater quality in an area where groundwater is the sole potable water supply is a most critical consideration. The EIS shows no significant potential adverse impact to groundwater quality from the use of on-site systems and small community systems in the growth areas.

The use of septic tanks and community systems for the growth areas and their impact on the down-gradient City water supply wells are fully considered in making this recommendation. The geological formations in northern Leon County, including the projected growth areas, should provide adequate protection for the drinking water (Floridan) aquifer. The Floridan Aquifer in much of this area is covered by the Miccosukee Formation and the Hawthorn Formation, a confining layer.

Operation and maintenance problems as well as siting and construction inadequacies are cited as reasons for doubting the effectiveness of on-site systems in growth areas. These are considered to be institutional problems that can be overcome. In addition, the use of small evaporation/percolation ponds, is considered to have minimal potential for adverse impacts to groundwater when operated properly and in conjunction with groundwater monitoring.

Alternative 4 has been known as the No-Federal-Action alternative throughout this study. It might be better described, however, by the term Limited-Federal-Action because some aspects of the recommended plan are eligible for federal funding. They include the following:

- The construction of the proposed interceptors shown on Figure III.1.
- The construction of on-site and small community systems as innovative and alternative technologies incumbent on the implementation of a public management agency, such as is described in this document.
- The facilities for the treatment and disposal of the septage and sludge from on-site and small community systems incumbent on the implementation of a public management agency, such as described in this document.

PART C. MITIGATIVE MEASURES

The success of Alternative 4 is chiefly dependent on obtaining effective treatment from a large number of small systems. Many of the environmental impacts identified in Chapter II for Alternative 4 are associated with the possibility of failure in on-site and small community systems. In the development of specific mitigative measures for the selected alternative, it is important to consider the potential causes of and the appropriate corrective actions in response on-site and small community system failures.

For this purpose two commonly used systems, one on-site and one small community, were investigated. A septic tank followed by a soil absorption field is a typical on-site treatment disposal system. The septic tank removes nearly all settleable solids and floatable grease and scum. This partially treated wastewater is applied to the soil absorption field where it is absorbed and treated by the soil as it percolates. Travel through two to four feet of unsaturated soil will provide adequate removals of pathogenic organisms and other pollutants from the wastewater. A commonly used small community system, especially in areas where surface water discharge is not likely to be permitted, is an extended aeration treatment system with disposal to an evaporation-percolation pond. Extended aeration is a biological treatment process which removes substantial amounts of BOD and suspended solids that are not removed by simple sedimentation. Evaporation-percolation ponds utilize the natural energy of the sun and the natural purification capabilities of soil to dispose of the treated effluent.

Both of these systems can be effective and environmentally sound with proper siting, design, installation, operation, and maintenance. When failures do occur they usually fall into a few general categories. Tables III.2 and III.3 contain, for each system, an identification of the types of failures which may occur, the environmental impacts of these failures, the possible causes for these failures, and the corrective actions which would be necessary to rehabilitate the system. In addition, measures are identified which would mitigate the impacts of these failures.

The primary goals of the mitigative measures identified in Tables III.2 and III.3 are to prevent, or lessen the chances of, the occurrence of a failure and to increase the chances of early detection and correction of any failures that do occur. The mitigative measures listed can be summarized by three principal recommendations:

1. The implementation of a management district or other means of on-site and small community systems management.

2. Revision of basic rules governing septic tank use to allow for systems more suited to current and future demands. These revisions should include siting criteria, basic system design, and the use of alternative systems.

3. Monitoring of groundwater quality in the developing areas of Leon County to ensure early detection of contamination of groundwater resources.

Management Districts

Poor operation and maintenance of on-site and small community systems is one cause leading to their failure. Public management of these systems is a possible means of ensuring that improper operation and maintenance does not contribute to system failure. Although poor operation and maintenance is recognized as one cause of septic system failure, regulatory agencies generally do not set standards or specific requirements to ensure proper operation and maintenance. In general, the regulations are applicable to the design and construction of septic systems but leave the operation and maintenance responsibility to homeowners.

Enforcement officials as well as researchers have identified enforcement problems as the weak link that leads to ineffective management and malfunctioning systems. Such problems include the following:

TABLE III.2

FAILURES AND MITIGATIVE MEASURES
SEPTIC TANK -- SOIL ABSORPTION FIELD SYSTEM

Type of Failure	Environmental Impacts	Possible Causes	Mitigative Measures	Corrective Actions
Overloaded absorption field; septic tank effluent breaks through ground surface	. Potential for surface water degradation from runoff . Odors . Potential for human contact and health effects	. Field initially designed too small . Substantial increase in water usage . Clogging by bacterial mats and sludge; insufficient solids removal by septic tank or septic tank not being pumped as needed . Improper method of drainfield installation . Unsuitable soil conditions or site characteristics . Water table higher than anticipated due to ungradient development	. Implementation of a management agency which would be responsible for: -Proper siting, design and installation of systems -An inspection and preventive maintenance program -Providing prompt attention to problems . Revision of regulations to allow greater site and design flexibility	. Increase absorbtion . Flow reduction measures . Eliminate clear water discharges . Oxidize clogging mat; pump out and repair or replace septic tank . More frequent maintenance . Dosing . Modification of site or system: regrading/filling/alternate system
Insufficient renovation by soil absorption field	. Transmission of minerals, nutrients, bacteria or viruses to groundwater	. Unsuitable soil conditions or characteristics; poorly structured, too rapidly permeable soils provide insufficient renovation . Unsuitable site; high groundwater, or geological characteristics provide direct path to groundwater	. Implementation of management agency as described above . Groundwater monitoring to increase chances of early detection . Revision of regulations to allow greater site and design flexibility	. Modification of site or system: filling/alternate system . Intercept flow to groundwater by subsurface drainage

TABLE III.3

FAILURES AND MITIGATIVE MEASURES
EXTENDED AERATION -- EVAPORATION-PERCOLATION POND SYSTEM

Type of Failure	Environmental Impacts	Possible Causes	Mitigative Measures	Corrective Actions
Mechanical failure; reduction of treatment efficiency	. Odor . Potential for human contact and health effects from effluent in ponds	. Blower or mechanical aerator failure . Pump and pipe clogging . Electrical motor failure . Corrosion and/or failure of controls . Electical malfunctions	. Installation of alarm system . Implementation of management agency which would be responsible for: -Proper siting, design and installation of systems -An inspection and preventive maintenance program -Stockpiling parts -Providing prompt attention to problems	. Repair or replacement of malfunctioning parts
Hydraulic overload of treatment system; reduction of treatment efficiency	. Odor . Potential for human contact and health effects from effluent in ponds	. Heavy rainfall; problem could be magnified by infiltration problems . Treatment system undersized . Sludge not removed regularly	. Conservative design . Installation of alarm system . Implementation of management agency as described above	. Correct infiltration problems . Expansion or modification of treatment system . More frequent maintenance
Hydraulic overload of disposal system	. Potential for surface water degradation from runoff	. Clogging of percolation surface . Heavy rainfall . Pond undersized	. Conservative design; storage volume for wet periods . System designed with dual ponds or chambered single pond; periodic resting included in maintenance program . Pond designed with well-vegetated, steep walls to prevent channels from developing through the walls . Implementation of management agency as described above	. Rejuvenation of percolation surface . Expansion or modification of disposal system
Insufficient percolation time from ponds	. Potential for a build-up of minerals and nutrients in groundwater	. Unsuitable soils or site characteristics	. Implementation of management agency as described above . Modify site or soils to ensure sufficient percolation prior to installation . Groundwater monitoring to	. Drain pond and modify infiltrative surface to ensure sufficient percolation

- Many agencies lack time and resources to control on-site and small systems adequately.
- Local authorities usually depend on the integrity and ability of soil testers and contractors to evaluate site and to design and install systems.
- Local authorities are sometimes pressured into approving the construction of septic systems on poor or marginal soils.

To overcome these problems, a number of communities have opted for public management of on-site and small community systems. Public entities must have the authority to control these systems. Essential controls and the authority to enforce them are:

Control Element	Authority Needed
Siting and Design	To enter property and do in-depth site envaluations.
Installation	To set design standards, design systems, and review designs.
Operation and Maintenance	To enter property to inspect and ensure proper operation and maintenance.
Problem Correction	To require and enforce repair or replacement of failing systems.

A public management agency can also be responsible for implementing certain measures which would further reduce the chance of failure of on-site systems:

- Initiate a project to analyze the causes of failure based on historical data and analyze each new failure reported. Identify trends in local as well as area-wide causes for failure. Use this information to anticipate future problems and respond with preventive maintenance activities in high risk neighborhoods.
- Establish a public education program. Develop a brochure for all homeowners using on-site systems describing the proper use of their systems and include it in their property tax bill or water bill, etc.
- Establish liaison with Tallahassee-Leon County Planning Department. Ensure that zoning officials are furnished maps of areas of known failure and areas of high risk so that development densities in these areas can be held to the level that physical systems can sustain.

The types of entities capable of managing decentralized wastewater treatment system such as that which could develop under the No-Federal-Action Alternative would depend on Florida rules and regulations. Entities capable of managing decentralized wastewater treatment systems include municipalities, counties, townships, electric cooperatives, and special districts. With proper authority, a public management entity can ensure the use of on-site and small community systems as effective wastewater management tools in preventing water pollution and public health problems.

Regulations

Current regulations controlling the siting and design of septic systems make it difficult to implement sufficient site or design modification to compensate for less than optimum conditions. State regulations do not allow installation of an on-site system where percolation rates exceed 15 minutes per inch. Percolation rates as slow as 60 minutes per inch have been shown to be effective because such percolation rates can be compensated for with lower loading rates. In addition, allowances for a slower percolation rate are recommended to help protect groundwater from contamination and allow for site and design modifications that are more flexible. Soils with high percolation rates may not properly renovate the wastewater in standard septic systems.

Design flexibility to fit the septic system to site conditions would allow creative solutions to specific problems. Presently, soil absorption beds are sized on the number of bedrooms in the residential home instead of the ability of the soil to absorb septic tank effluent. With siting and design flexibility, installation that would not have worked on a particular site can be avoided. Design flexibility would also allow the use of alternative systems such as pressure dousing and split bed application.

Additional flexibility for site selection can be obtained by using the U.S.D.A. Soil Texture Classification instead of the United Classification system in regulations. The United Classification system arranges soil types in large groups which tend to include soils that can be useful for wastewater renovation with those that are of limited use. In contrast, the U.S.D.A. Soil Texture Classification System identifies the soils in more detail and allows better use of soil types.

Groundwater Monitoring

Groundwater quality monitoring in developing areas of Leon County, where on-site or small community systems will be used, should begin before each subdivision is started. This will allow background information to be developed as well as the identification of the effects on groundwater from construction activity. Continual monitoring throughout the construction and life of the development will ensure that groundwater contamination is quickly detected, localized and corrected. With the location of monitoring wells up and down gradient of the groundwater movement and within the development area, the impact to groundwater resources can be detected. Should adverse conditions appear to be developing, corrective actions, such as those shown in Tables III.2 and III.3, can be taken.

CHAPTER IV - EXISTING ENVIRONMENTAL CONDITIONS AND ENVIRONMENTAL IMPACTS OF ALTERNATIVES

PART A. INTRODUCTION

The purpose of this section of the Environmental Impact Statement is to document the setting for the natural and man-made environments around which wastewater management alternatives can be developed and evaluated. The information was compiled based on a literature search, interviews with agency officials and scientists, input from the EIS Review Committee and field sampling programs. Given a clear understanding of the environmental baseline, the project team was able to assess primary and secondary impacts of federal actions and recommend mitigative measures for each alternative evaluated.

B. EXISTING NATURAL ENVIRONMENT

1. CLIMATE

Temperature changes, precipitation, and wind conditions have implications for the design, operation, and maintenance of wastewater treatment and disposal facilities. Among the concerns raised during the 201 Study public participation process were the public health hazards that could result from the use of spray irrigation. In particular, there was concern about the transmittal of bacterial or viral diseases by aerosols and the possibility of contamination of groundwater which supplies the majority of public water in the area. As a result, climatological conditions were a significant consideration in the development of feasible physical system alternatives.

Leon County is located 20 miles from the Gulf of Mexico and has a mild and moist climate that is characteristic of the Gulf States. Unlike counties in southern Florida, Leon County experiences a definite change of seasons.

Temperature

The average year-round temperature in Tallahassee is 68°F (20°C) and has varied between 65°F (18.3°C) and 71°F (21.6°C). The winters are comparatively mild. The 10-year average for winter is 57°F (13.9°C) with freezing temperatures of 32°F (0°C) occurring on the average of 23 times per winter. The lowest temperature recorded in Tallahassee was in 1899, when the mercury dropped to -20°F (-28.8°C). The first freeze generally occurs about November 26, but has been recorded as early as October 31. The last freeze is normally February 28, but has been noted as late as April. Summers are hot and humid. The average temperature is 80°F (26.6° C) and on rare occasions reaches 100°F (37.7°C) degrees. Nighttime temperature is normally below 75°F (23.9°C).

Rainfall

The average yearly rainfall is about 61 inches (154.9 cm) with variations from as low as 30.98 inches (78.7 cm) to 104.18 inches (264.6 cm). July is the wettest month and October and November are the driest months. A secondary but significant maximum in rainfall occurs during the early spring months. The most recent wet periods, occurring in 1964, 1973, and 1975, caused the large lakes to overflow.

Winds

Prevailing winds average 7.7 miles per hour. They are from a southerly direction in the spring and summer and shift toward a more northerly direction near the end of the year. High winds are infrequent and of short duration, usually associated with strong cold fronts in the late winter and early spring months. Hurricanes are a threat to the area almost every year, but have seldom passed close enough to inflict substantial damage in Leon County. The last hurricane occurred in 1941. The likelihood of a hurricane occurrence in the coastal area is about once every 17 years, with fringe effects felt about once every five years.

Odor

No major odor producers are identified within the boundaries of the EIS study area. A few potential sources of odor such as sewage treatment plants and light industry exist, but these are apparently under control. The City of Tallahassee Sewer Division has not received any recent odor complaints from within the study area (Dean, 1979).

The City of Tallahassee Sewer Division has tried to anticipate odor problems emanating from its facilities by utilizing chlorinators at pump stations and by chlorinating discharging effluent and spray- irrigated effluent. In an inspection of the treatment facilities in November, 1979 and May, 1979, only minimal odors were encountered. Operations personnel report that odor problems may occur at times when the aerobic digesters at the T. P. Smith plant are not operating because of supernatant drawing off or filling the digester. During this down period, the sludge in the tanks may turn septic, producing odor. Attempts are being made to resolve this problem by adding hydrogen peroxide to prevent the sludge from becoming septic and by reducing the downtime of the digesters.

2. AIR QUALITY

In compliance with federal law, the Florida Department of Environmental Regulation (FDER) has established ambient air quality standards. These are listed in Table IV.1. To enforce these standards, FDER has established air quality monitoring stations throughout the state. Three are located in the Tallahassee area and are listed below:

	Monitoring Site Location	Air Quality and Meteorological Parameters Measured
1.	Bannerman and Scott Tower Roads	Ozone, windspeed, and direction
2.	2965 Appleyard Drive	Total suspended particulates
3.	Sears Building East Lafayette Street	Total suspended particulates

According to FDER, no major violations have been reported recently, and air quality in the study area has been good. The region has no industry or electric generating plant that is considered a major source of air pollution. The main source of air pollution is exhaust emissions from vehicles. Construction activity and occasional burning of trash and debris result in minor, short-time local pollution.

3. NOISE

The outside noise environment of the study area may be visualized as nodes of high noise levels in commercial and industrial areas and nodes of moderate noise levels in residential areas. These nodes are connected by corridors of high noise levels from surface transportation such as highways and railroads. However, there are large differences in noise levels between similar land uses in the study area:

TABLE IV.1
AMBIENT AIR QUALITY STANDARDS

Pollutants	Maximum One Hour Concentration *	Maximum Three Hour Concentration *	Maximum Eight Hour Concentration *	Maximum 24 Hour Concentration *	Annual Arithmetic Mean **	Annual Geometric Mean **
Sulfur Dioxide		1300 micrograms per cubic meter (0.5 ppm)		260 micrograms per cubic meter (0.1 ppm)	60 micrograms per cubic meter (0.02 ppm)	
Particulate Matter				150 microgram per cubic meter		60 micrograms per cubic meter
Carbon Monoxide	40 milligrams per cubic meter (35 ppm)		10 milligrams per cubic meter (9 ppm)			
Photochemical oxidents measured and corrected for interference due to nitrogen oxides and sulfur dioxide.	160 micrograms per cubic meter (0.08 ppm)					
Hydrocarbons. For use as a guide in devising implementation plans to achieve oxidant standards. To be measured and corrected to methane.		160 micrograms per cubic meter (0.24 ppm) between 6 to 9 am				
Nitrogen Dioxide					100 micrograms per cubic meter (0.05 ppm)	

* Not to be exceeded more than once per year.

** Not to be exceeded.

Description	Locale
Quiet Residential	Lafayette Oaks, Killearn Lakes Area
Average Residential	Capital City Country Club Area
Semi Commercial/ Residential	FSU, Florida A & M Areas
Commercial	Central Business District

A more specific approach to describing the noise environment of the study area is to identify the primary sources of noise. In the typical urban area, aircraft, highways, railroads, industrial plants, construction, and homeowner equipment have been identified as major sources of noise. The most extensive and pervasive sources in the outside environment are aircraft and surface transportation. Within the study area, the following noise generators influence the noise environment.

Noise Generator	Description
Tallahassee Municipal Airport	The airport is located southwest of the City limits. Intrusive noise levels have been recorded along the airport's major flight paths.
Railroad Corridors	The Seaboard Coast Line runs east and west through the central section of Tallahassee, with a spur extending south from the City.
Interstate 10, U.S. 319, U.S. 90, U.S. 27	These major roads carry automobile traffic through and around Tallahassee.

4. PHYSIOGRAPHY

The physiography of an area is a profile of its geologic, topographic, and soils characteristics. These factors are important in deciding the locations and design of sewage facilities and in determining the limitations they may place upon certain land uses. In particular, the analyses of these characteristics provide data on the suitability of certain locations for on-lot disposal of sewage or the potential for spray irrigation of treated sewage effluent or sludge disposal.

Geology/Topology

From a local viewpoint, Hendry and Sproul (1966) have recognized three major physiographic divisions of Leon County: 1) the Northern Highlands, 2) the Gulf Coastal Lowlands, and 3) the River Valley Lowlands. (Hendry, C. and C. Sproul, Geology and Ground-Water Resources of Leon County, Florida. Florida Geological Survey, Bulletin #47, 1966.) Development in the study area has taken place mainly in the Northern Highlands, which is projected as the major future growth area, and to a lesser degree in the Gulf Coastal Lowlands.

The Northern Highlands (or Tallahassee Hills) include the hills in the northern part of the County that are immediately underlain by the Hawthorn Formation and the Miccosukee Formation. They lie north of and immediately adjacent to the lower Pleistocene coastal deposits. The area is Miocene Pliocene delta plain surface that has been dissected by streams and further modified by subsurface solution. The resulting topography is characterized by erosional remnant hills with relief up to 120 feet. The highest hills are comparatively flat-topped with elevations of about 260 feet. The slopes and crests of the hills give the overall appearance of mature topography that is gentle and moderate.

The hills are composed of a heterogeneous mixture of yellow-orange clays, silts, and sands that are weakly cemented. In roadcuts and excavations these clastics resist erosion and may be seen for years standing in nearly vertical cliffs. The loamy soils developed on the hills support a lush natural vegetation, and the impermeable nature of the sediments give rise to small wet-weather ponds and lakes in the lower areas. The southern terminus of the Tallahassee Hills is abruptly separated from the adjoining lowlands by a distinctive escarpment, named the Cody Escarpment.

The Gulf Coastal Lowlands cover the southern half of Leon County. Throughout the Pleistocene, each advance of the sea produced a gently seaward-sloping plains called terraces, and each terrace is separated from the ajoining higher and older one by a seaward-facing erosional escarpment. Two marine terraces are recognizable in Leon County. For the most part, the Gulf Coastal Lowlands are composed of light gray to buff-colored loose quartz sandhills to the north. The Coastal Lowlands are divided into two major units: the Apalachicola Coastal Lowlands and the Woodville Karst Plain.

The Apalachicola Coastal Lowlands are characterized by essentially flat, sandy surfaces marked by many small densely wooded swamps with a few shallow, poorly defined creeks. The area is underlain by sand and clay deposits up to 80 feet thick. The water table is close to the surface, and the area is swampy during the rainy periods. Even though the area is characteristically wet, lakes are few.

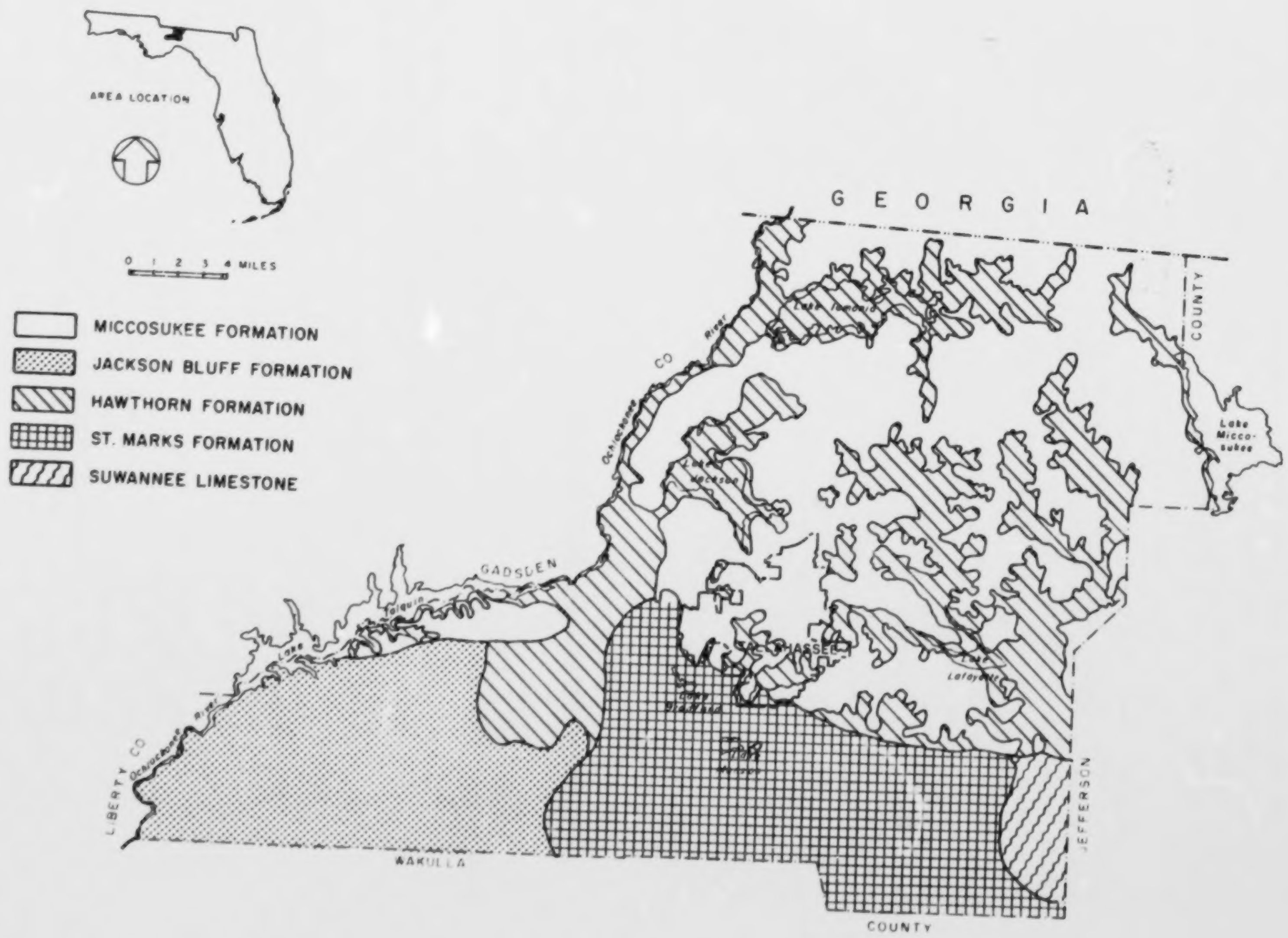
The Woodville Karst Plain is a gently sloping plain extending from the southern edge of the Tallahassee Hills to the Gulf of Mexico. It is characterized by loose, quartz sands, thinly veneering a limestone substrata resulting in a sinkhole-sand dune topography. The porous and permeable veneering sands permit rapid entry of rainwater into the underlying limestone. As a result, the area has been continuously and rapidly lowered from its original level and is presently covered with sinks that appear as shallow sand- filled depressions. Most water that falls on the area or enters as streams from outside the area immediately disappears into the subsurface; few surface streams have developed or exist. Along the northern and western borders of the Woodville Karst Plain, areas of more prominent sand hills exist which contain small lakes.

Streams and stream valleys of the Ochlockonee and St. Marks Rivers make up the River Valley Lowlands physiographic unit. The area along each river is narrow, and because of the nature of the sediments through which each flows, the valleys are different. The Ochlockonee River Valley Lowlands is the area included in the floodplain terraces of the Ochlockonee River. This area is usually well delineated by both the nature of the sediments and by fluvial escarpments that separate it from the Tallahassee Hills. Three stream terraces occur at 10, 40-50, and 90-100 feet above the floodplain. The St. Marks River Valley Lowlands head up in the Tallahassee Hills of eastern Leon County. These lowlands are narrow, usually poorly perceptible, and without fluvial terrace surfaces. The stream is slightly incised into bedrock, and the very thin veneer of loose quartz sands that overlie bedrock do not provide for well-defined banks or a delineated flood plain. Because the water table is usually very high, the river flows through swampy terrain. About three-quarters of a mile above the Leon-Wakulla County line, the St. Marks River disappears into sinks and reappears as springs. South from this point, the St. Marks River flows in a well-defined channel cut into bedrock.

Surficial Geology and Stratigraphy

Figure IV.1 shows the geographic distribution of geological materials in Leon County. Their characteristics are described below:

- The Miccosukee Formation is a heterogeneous series of inter-bedded and cross-bedded clays, silts, and sands and gravels of varying coarseness. These deposits cap the higher hills. Thickness ranges from 0 to 90 feet.
- The Jackson Bluff Formation sediments are clayey sands and sandy clays that are very macrofossiliferous. Varying from a few inches to over 10 feet thick, the formation acts as a confining bed.
- The Hawthorn Formation is composed of medium-grained quartz sand, phosphorite, silt, clay, and impure limestone lenses near the base. The silt and clay fraction reduces the overall permeability of the formation and causes this unit to serve as a confining sequence on top of the principal artesian aquifer. The sand, silt, clay portion is locally used as a road base material.


AREA LOCATION
0 1 2 3 4 MILES
MICCOSUKEE FORMATION
JACKSON BLUFF FORMATION
HAWTHORN FORMATION
ST. MARKS FORMATION
SUWANNEE LIMESTONE
GEORGIA
COUNTY
Lake Miccosukee
Lake Iamonia
Ochlockonee River
CO
Lake Jackson
GADSDEN
Talquin
Lake
Ochlockonee River
LIBERTY CO
TALLAHASSEE
Lake Lafayette
WAKULLA
COUNTY
JEFFERSON

FIGU

SOURCE OF BASE MAP: State of Florida,
Department of Transportation

LEON COUNTY
GEOLOGY

- The St. Marks Formation is a sequence of carbonates with quartz sand and clay impurities that restrict its permeability. Though this formation is part of the upper sequence of the principal artesian aquifer, it is not an important water-producing unit.

- The Suwanee Limestone is a very pale orange, abundantly micro fossiliferous, granular, partically recrystallized limestone with a finely crystalline matrix. In this area it is entirely a subsurface formation that is porous and permeable. It is the principal aquifer from which most of the wells are supplied.

In the subsurface are a number of different geologic formations. The Crystal River Formation underlies the Suwanee Limestone. This formation consists of a very pale orange, microcoquinoid, very porous and permeable calcirudite, and a grayish orange, recrystallized, very dense dolomite, with some molds and casts of fossils. Since no water wells in the County have completely penetrated this material, the thickness can only be estimated from oil tests. In the southeastern portion of Leon County it is approximately 400 feet thick.

Slopes

The Leon County area can be classified into three general slope conditions. Slopes of less than one percent cover about 20 percent of the land surface in areas generally associated with streams and their floodplains. Land use in these areas is somewhat restricted because of the possibility of periodic flooding. About 25 percent of the land has slopes between one and four percent. Topographically, such slopes are represented by the tops of hills or by areas separating stream valleys from areas of steeper slopes. No severe restraints to land use are imposed by these mild slopes. The remainder of the County has slopes exceeding four percent in areas characterized by gently rolling topography. Land use restraints are minimal in these areas. Slopes may exceed 10 to 15 percent in some areas along drainage ways. Such areas may pose some land use difficulties.

Soils

The effects of soil characteristics on agriculture, silviculture, construction, waste disposal, recreation, water management, and other uses have been categorized by the U.S. Soil Conservation Service (SCS) to guide individuals in finding the most suitable means of utilizing available land resources. From preliminary field surveys, soil samples, comparisons with nearby areas, and aerial photograph examinations, soil scientists have mapped individual soil units for portions of Leon County. These maps are very detailed and are very useful when considering the suitability of smaller areas for building lots, agricultural fields, septic tank absorbtion fields and spray irrigation sites.

At a larger scale, individual soils of like character are grouped into a soil association. The properties of the soil association are derived from the properties of the dominant soil among the component soils of the association. Among the soil characteristics collected are physical and chemical properties, soil erosion factors, wind credibility, and limitations of soils for particular uses. See Figure IV.2.

In April 1978 the Soil Conservation Service (SCS) issued policy and procedures for preparing soil potential ratings. Soil potential ratings differ from the soil limitation ratings which are commonly used in that they take into account corrective measures needed to overcome restrictive soil features and they indicate a soil's relative quality for a specific use compared with other soils in a specific area. In a pilot project conducted in Leon County in September 1978 (Guthrie, 1980), soil potential ratings were developed for septic tank absorbtion fields in Leon County. The results of this project are shown in Table IV.2.

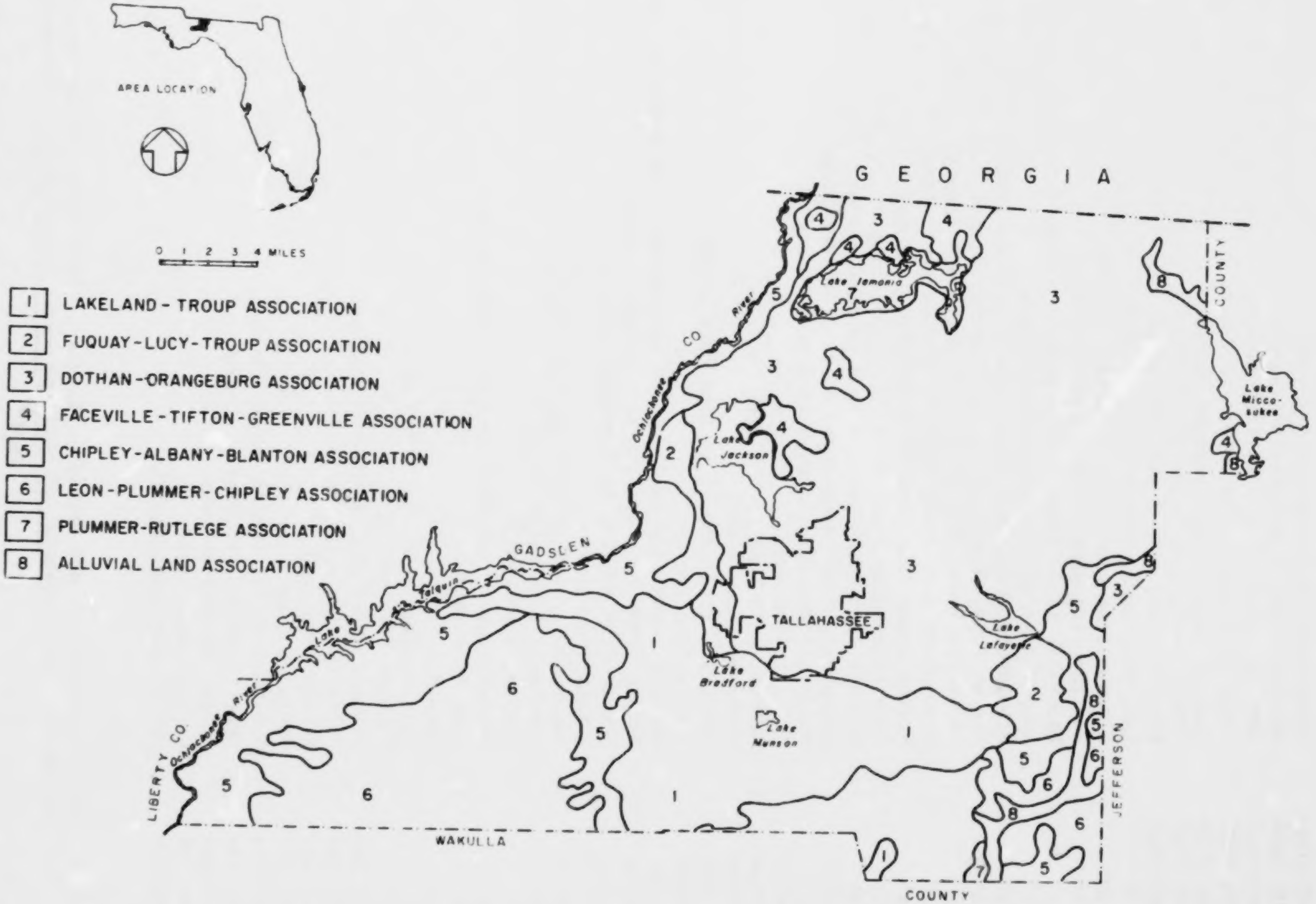
The soils in the Tallahassee area and northeastern Leon County are generally well-drained loamy sand to sandy loams. These acidic soils support an abundant natural growth of hardwoods and pine. Pasture grasses and corn thrive in this area. Although the SCS has identified only the upper five feet of the soils, it is known from geological studies that they extend downward as much as 300 feet. In general, these soils will not accomodate as large a hydraulic loading rate as will the sands in the southeastern part of the County. This condition is a result of the presence of a relatively large fine fraction.

If nitrogen removal by the cover in this area crop is an imposed requirement of a spray irrigation system, then the assimilative capacity of the vegetation may become a limiting factor. Assuming this limiting factor. Assuming this limiting factor, the attractiveness of the somewhat hydraulically limited soils of the Tallahassee Hills for spray irrigation is increased. The soils are generally suitable for on-site systems. A larger soil absorbtion field than would be necessary in the southeastern part of the county would be required here because of slower percolation rates.

The soils in southern and southeastern Leon County are generally well to excessively drained. Recent (1972) soil explorations for structural foundations at the Southwest treatment plant showed sands to 45 feet below the surface. A groundwater table was not observed. These sands of the Lakeland Series overlie the St. Marks Formation of the Floridan Aquifer and are capable of accomodating very large hydraulic loadings.

Although research is incomplete, experiments have shown that high phosphate removals can be achieved with cover crops. The natural vegetative cover in this area is mainly pine, black-jack, and turkey oak. Corn has been grown on a land-spreading test plot with outstanding success as has winter rye. These cropping successes, on otherwise rather poor soils, indicate high nutrient removals. Coastal bermuda has shown some promising results for nutrient removal at the experiment station in Tifton, Georgia.

The soils in southwestern Leon County are nearly level, somewhat poorly drained sands overlying thick beds of clastics. Practically all


AREA LOCATION
0 1 2 3 4 MILES
1 LAKELAND - TROUP ASSOCIATION
2 FUQUAY - LUCY - TROUP ASSOCIATION
3 DOTHAN - ORANGEBURG ASSOCIATION
4 FACEVILLE - TIFTON - GREENVILLE ASSOCIATION
5 CHIPLEY - ALBANY - BLANTON ASSOCIATION
6 LEON - PLUMMER - CHIPLEY ASSOCIATION
7 PLUMMER - RUTLEGE ASSOCIATION
8 ALLUVIAL LAND ASSOCIATION
GEORGIA
Ochlockonee River
CO
Lake Iamonia
Lake Jackson
Lake Miccosukee
COUNTY
GADSDEN
Talquin
Lake
TALLAHASSEE
Lake Bradford
Lake Munson
Lake Lafayette
JEFFERSON
LIBERTY CO
Ochlockonee River
WAKULLA
COUNTY
1
2
3
4
5
6
7
8

SOURCE OF BASE MAP: State of Florida,
Department of Transportation

SOURCE: The Florida General Soils Atlas With Interpretations, For Regional
Planning Districts I & II Division Of State Planning, 1974

LEON COUNTY
GENERAL SOILS MAP

FIGURE IV-2

TABLE IV.2
POTENTIAL OF SOILS IN LEON COUNTY FOR SEPTIC TANK ABSORPTION FIELDS

Rating	Soil
Very high	Alpin sand, 0 to 5 percent slopes
Very high	Kershaw sand, 0 to 5 percent slopes
Very high	Lakeland sand, 0 to 5 percent slopes
Very high	Troup fine sand, 0 to 5 percent slopes
Very high	Foxwood sand, 0 to 5 percent slopes
Very high	Ortega sand, 0 to 5 percent slopes
Very high	Kershaw sand, 5 to 8 percent slopes
High	Lucy fine sand, 0 to 5 percent slopes
High	Blanton fine sand, 0 to 5 percent slopes
High	Bonifay fine sand, 0 to 5 percent slopes
High	Faceville sandy loam, 2 to 5 percent slopes
High	Lucy fine sand, 5 to 8 percent slopes
High	Orangeburg fine sandy loam, 2 to 5 percent slopes
High	Wagram loamy fine sand, 0 to 5 percent slopes
High	Faceville loamy fine sand, 5 to 8 percent slopes
High	Orangeburg fine sandy loam, 5 to 8 percent slopes
High	Wagram loamy fine sand, 5 to 8 percent slopes
High	Faceville sandy loam, 8 to 12 percent slopes
High	Norfolk loamy fine sand, 5 to 8 percent slopes
High	Orangeburg fine sandy loam, 8 to 12 percent slopes
High	Norfolk loamy fine sand, 5 to 8 percent slopes
Medium	Chipley fine sand
Medium	Arents, 0 to 5 percent slopes
Medium	Leefield loamy sand
Medium	Lutterloh fine sand, 0 to 5 percent slopes
Medium	Ocilla fine sand
Medium	Norfolk loamy fine sand, clayey substratum, 5 to 8 percent slopes
Medium	Dothan loamy fine sand, 2 to 5 percent slopes
Medium	Fuquay fine sand, 0 to 5 percent slopes
Medium	Albany loamy sand
Medium	Fuquay fine sand, 5 to 8 percent slopes
Low	Lynchburg fine sandy loam
Low	Chaires fine sand
Low	Dothan loamy fine sand, 5 to 8 percent slopes
Low	Leon fine sand
Low	Sapelo fine sand
Low	Talquin fine sand
Low	Plummer fine sand
Very low	Plummer mucky fine sand, depressional
Very low	Surrency fine sand
Very low	Pelham fine sand
Very low	Rutledge loamy fine sand
Very low	Rutledge soils, occassionally flooded
Very low	Meggett soils, frequently flooded
Very low	Yonges fine sandy loam
Very low	Dorovan mucky peat
Very low	Pamlico-Dorovan complex

Source: Guthrie, Richard L. and Gerald J. Latshaw. Soil-Potential Ratings in Leon County, Florida. "Journal of Soil and Water Conservation. November-December 198 of the area is devoted to the Apalachicola National Forest. There are numerous swampy areas, so very little of the area is suitable for land-spreading, spray irrigation, or on-site systems.

5. SURFACE WATER RESOURCES

Surface water bodies and streams within Leon County are discussed in relation to the physiographical areas in which they occur. A summary of current water quality is also presented for the major bodies of water. Figure IV.3 gives their location within Leon County. The material presented is adapted from the Tallahassee-Leon County, Florida 201 Facilities Plan.

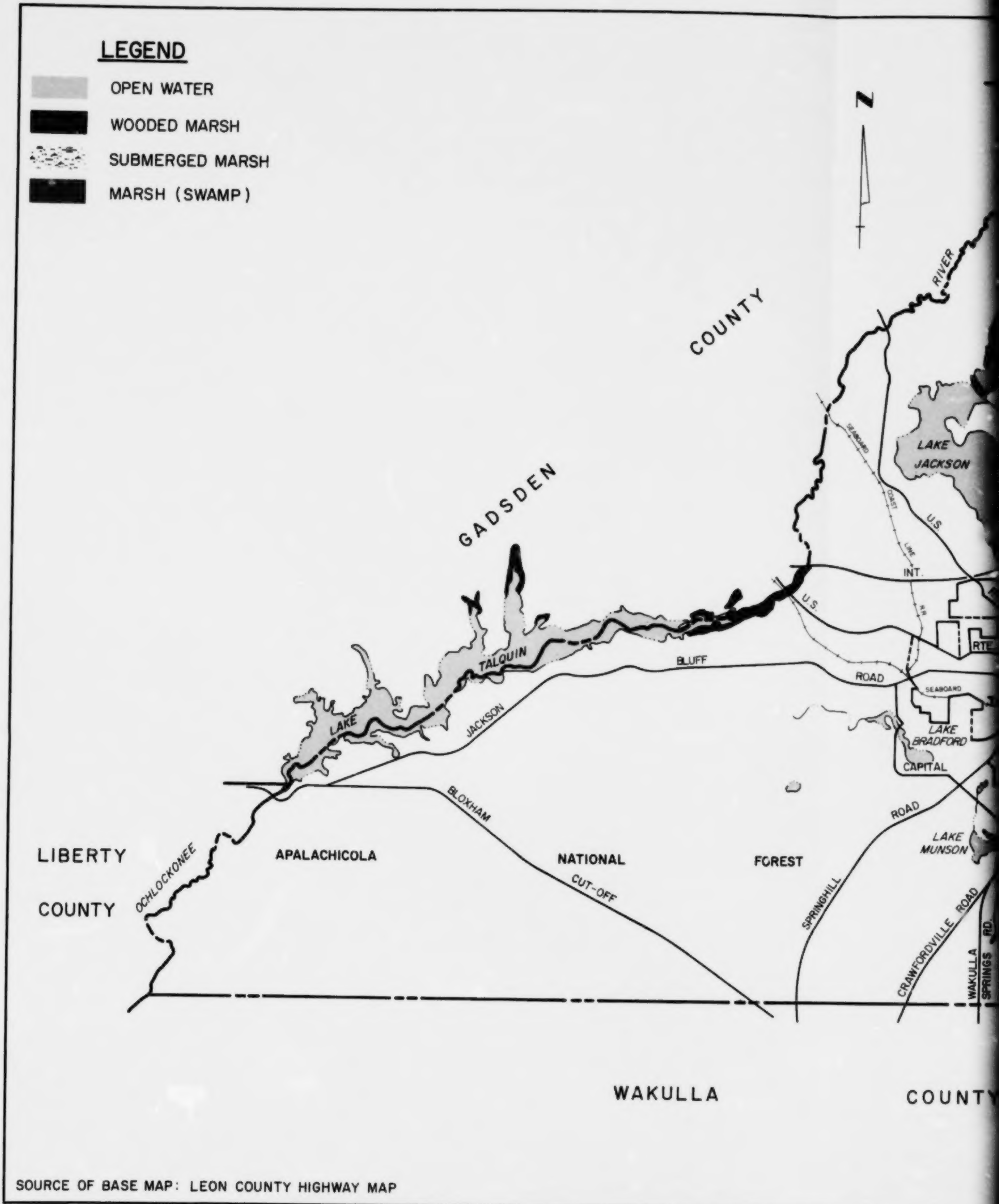
Large Lakes

Five bodies of water can be considered large lakes: Iamonia, Jackson, Lafayette, Miccocukee, and Talquin. Lake Talquin, on the Ochlockonee River is the only man-made impoundment; the other four lakes are natural and are thought to be of similar origin. Each lake occupies an ancient stream valley in the Tallahassee Red Hills. The stream valleys, having settled into the underlying limestone by dissolution, left the old downstream portion of the valleys stranded. Today each lake has a direct flow connection with the limestone aquifer via one or more sinkholes. This in turn allows the water level of the lakes to fluctuate greatly even to the point of going completely dry. The fluctuations in water levels result in varying diversity and density of plants and animals in the area surrounding the lakes.

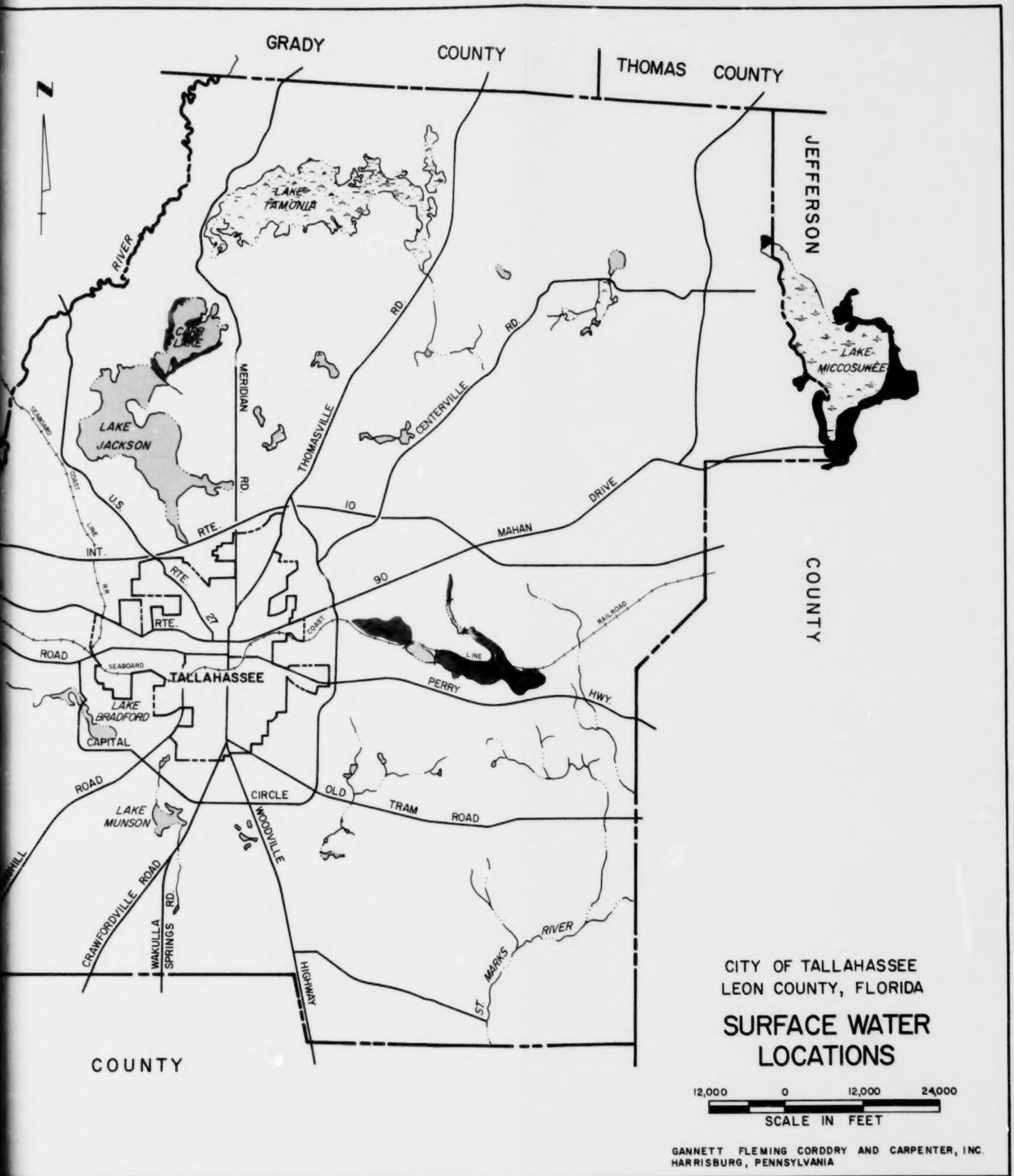
Under natural conditions, when the lakes are left to drain or refill via the underlying limestone they accumulate organic sediments during long periods when waters is relatively high. When the lakes periodically dry up, the sediments are exposed to air and decompose. Depending on the length of the exposure, the eutrophication is partially or wholly reversed. At present, water levels in Lake Miccosukee and Lake Iamonia seem to be favoring a net process of eutrophication because of the apparent continuing increase of organic sediments and build-up of aquatic vegetation. Lake Jackson is not as far along in this process but may be tending toward it.

Figure IV.3 shows the lakes as they are depicted on the U.S.G.S. Topographic Maps. The study area is covered by the following quadrangles:

1. Calvary, 1956
2. Beachton, 1957
3. Miccosukee, 1957
4. Havana South, 1963


LEGEND
OPEN WATER
WOODED MARSH
SUBMERGED MARSH
MARSH (SWAMP)
N
GADSDEN
COUNTY
RIVER
LAKE JACKSON
SEABOARD
COAST
LINE
RR
U.S.
INT.
U.S.
RTE
LAKE
TALQUIN
BLUFF
ROAD
SEABOARD
JACKSON
LAKE BRADFORD
CAPITAL
BLOXHAM
ROAD
LAKE MUNSON
LIBERTY
COUNTY
OCHLOCKONEE
APALACHICOLA
NATIONAL
FOREST
CUT-OFF
SPRINGHILL
CRAWFORDVILLE ROAD
WAKULLA
SPRINGS
RD.
WAKULLA
COUNTY

SOURCE OF BASE MAP: LEON COUNTY HIGHWAY MAP


GRADY COUNTY
THOMAS COUNTY
JEFFERSON COUNTY
COUNTY
N
RIVER
LAKE TAMONIA
CARR LAKE
LAKE JACKSON
LAKE MICCOSUKEE
MERIDIAN RD.
THOMASVILLE RD.
CENTERVILLE RD.
SEABOARD COAST LINE R.R.
U.S. RTE. 27
INT. RTE. 10
MAHAN DRIVE
U.S. 90
RTE.
COAST LINE RAILROAD
ROAD
SEABOARD
TALLAHASSEE
PERRY HWY.
LAKE BRADFORD
CAPITAL CIRCLE
ROAD
OLD TRAM ROAD
LAKE MUNSON
WOODVILLE HIGHWAY
CRAWFORDVILLE ROAD
WAKULLA SPRINGS RD.
ST. MARKS RIVER
HILL
12,000
0
12,000
24,000
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

SURFACE WATER LOCATIONS

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE IV. 3

5. Lake Jackson, 1963
6. Bradfordville, 1963
7. Miccosukee, 1963
8. Midway, 1969
9. Tallahassee, 1970
10. Lafayette, 1954
11. Lloyd, 1954
12. Hillardville, 1969
13. Lake Munson, 1969
14. Woodville, 1954
15. Cody, 1954

Major Rivers

Associated with Leon County are two major rivers, the Ochlockonee which forms the western border of the County and the St. Marks found in the southeastern portion of the County. Limestone underlies both river valleys which are located in the Tallahassee Red Hills. The underlying limestone exerts a predominant influence on the surface drainage on the County. At Natural Bridge on the lower St. Marks River the river disappears into a limestone sink only to reappear a short distance downstream in a broad open basin. The upper St. Marks below the Lake Lafayette basin in acidic, swampy and subject to periodic drying during annual droughts. However, the segment below the vicinity of Horn Springs is a relatively more permanent stream, probably sustained from spring discharge. It supports extensive submerged aquatic vegetation, similar to the Wakulla River.

This region is swampy in nature, and during periods of high rainfall the rivers can overrun their banks and create large ponded areas.

Small Permanent Lakes and Ponds

Leon County has many relatively permanent lakes and ponds that are smaller than the five large lakes. Some of these are Moon Lake, Silver Lake, Eagle Lake, Lake Munson, Orchard Pond, Lake Bradford, the Cascades, Dog Pond, Dog Lake, Lake Hall, and Lake Ella. Most of them occur in limestone solution depressions and are filled by groundwater; thus, the lake surface is an external expression of the water table. Some lake bottoms contain sinks and fluctuate through a greater range than others.

Where limestone is not near the surface (as in the Apalachicola Flatwoods), no lakes of this size occur.

Open Sink Ponds

In the Woodville Karst Plain there exist a number of open sink ponds, some examples being Gopher Sink and Dismal Sink. These were formed when the limestone ceilings of underground cavities collapse, partially filling with groundwater. Upon collapse, a relatively steep-sided pond is formed which eventually eroded to a more gradual slope. The erosion process gradually plugged the open connection with the groundwater forming clear, cool, ponds. As a result of isolation from one another, these ponds formed their own unique ecosystems.

Ephemeral Ponds

Many small bodies of water in Leon County are called ephemeral ponds because they tend to dry up. Their origins differ greatly. In the Apalachicola Flatwoods these ponds formed in depressions having a clay hard pan underlying them. Most of the ponds have mixtures of cypress and blackgum overstories with one species predominating. These overstories can form over open sinkholes which fill in with sediments. These ponds are found in the Woodville Karst Plain area.

Another ephemeral pond is the floodplain type which forms in depressions in both the river valley terraces and floodplains of the Ochlockonee River. They are found to a much lesser extend in the St. Marks River. This small water body fills and drains in response to either the rise and fall of perched water tables or annual high river levels on the floodplain. Occasionally small ponds are found which remain grassy most of the year. These fill for a few weeks during periods of high rainfall.

Freshwater Marshes

Leon County has only a few marshes confined to the edges of the larger lakes. The relief of the Tallahassee Red Hills and the sandy soils of the southern portion of the County do not lend themselves to the formation of marshes.

Branch or Creek Swamps

Branch or creek swamps in this region occur along fourth or fifth order tributaries. They may be wet, sphagnaceous woodlands bordering creeks that periodically are inundated by heavy runoff or wet, boggy sites that develop along seepage slopes. The relief is low but still enough to prevent excessive peat accumulation.

River Swamps

River swamps occur along the St. Marks and Ochlockonee Rivers in rich broadleaf woodlands that periodically become inundated by high river waters. The Ochlockonee transports considerable mineral sediments which are deposited on the floodplain floor when the river overflows its banks. An alluvial floodplain such as this prevents an extensive build up of organics and peats.

The St. Marks, on the other hand, being smaller and having a lower gradient rarely transports mineral sediments. This swamp habitat is gum-cypress, often with standing water and tending to accumulate organic sediments.

Current Water Quality Summary

The following material summarizes the current water quality for the major surface waters within Leon County including the major lakes and Ochlockonee and St. Marks Rivers. The basis for the summary is the 201 Plan for Tallahassee-Leon County. Pollutants entering surface waters are primarily from natural drainage and street runoff. Lake Munson is the only lake in the planning area with a point source inflow. Chemical and biological investigations of the lakes and rivers, excluding Lake Munson, indicate that the water quality is good, and the lakes are assimilating their present pollution loading.

This summary has been divided into two sections; one for the major lakes, Table IV.3, and one for the major rivers, Table IV.4. These tables depict the existing conditions of the major surface waters within Leon County.

6. GROUNDWATER RESOURCES

The groundwater reservoir in Leon County consists of a sequence of limestones and dolomites. The saturated portion of the overlying sands,

TABLE IV.3

CURRENT WATER QUALITY SUMMARY FOR SELECTED LAKES

Lake	Average Orthophosphate (mg/1)	Average Nitrate-N (mg/1)	Total Alkalinity (mg/1)	Comments
Lake Jackson	.06	.09	5	- Water Quality: Good - Nutrient Values: Low - Pollutional Load: High - Assimilative Capacity: Low - Meginnis Arm: Water quality degraded
Lake Munson	High	5	80	- Nutrified State - Assimilative Capacity - Over-extended
Lake Miccosukee	0.00-0.05	1.0	-	- Water Quality: High - Assimilative: Very low - Moderately Nutrified
Lake Talquin	0.14	0.89	9	- Water Quality: Changing constantly - Low Flow assimilative capacities already read
Lake Lafayette	Low*	Low*	-	- Water Quality: Good - Remains healthy due to periodic drying of bed

*As reported by FDER.

TABLE IV.4

CURRENT WATER QUALITY SUMMARY
FOR THE TWO MAJOR RIVERS

River	Gradiation (ft/mile)	Flow (cfs)			Drainage Area (Sq. Mi.)	D.O. @ 24° C mg/1	Average Orthophosphate (mg/1)	Nitrate
		Low	Avg.	High				
Ochlockonee	1.5	*17	1030	55900	*1140	*7.3	9.49	High
Comments:	Water quality good. High nutrients but river able to assimilate its load.							
St. Marks	2.5	**310	674	4010	535	**7.0	0.08	0.40
Comments:	Water quality high. Water clear. Fluctuating flows keep stream free of natural pollution effects.							

*Station @ Highway 27
**Station @ Leon-Wakulla County Line @ Newport

clays, and silts is also utilized in some localities. The limestone and dolomite section is named the Floridan Aquifer and is the principal source of groundwater in Leon County. The overlying sands, silts, and clays comprise the Floridan Aquiclude and confine the water in the Floridan Aquifer under artesian pressure. Some beds in the Floridan Aquiclude yield small supplies of groundwater and are called water table aquifers.

Water Table Aquifers

Groundwater occurs under water table conditions in relatively thin, discontinuous sand lenses within the Miccosukee and Hawthorn Formations in the northern half of Leon County. This water is perched at elevations above that of the regional water table. Water table wells can range from less than 10 feet to almost 200 feet above sea level depending on local geology. Dug wells draw water from these sand lenses and average 30 to 60 feet in depth and 3 to 5 feet in diameter. Yields are small and undependable in times of drought. The water obtained is soft; high in iron, turbidity, and color; and susceptible to pollution from surface water. Water table aquifers store large quantities of water and transmit it slowly to the underground Floridan Aquifer.

Floridan Aquifer

The Floridan Aquifer consists of Miocene through middle Eocene age limestones that act generally as a hydrologic unit. This aquifer underlies all of Florida and parts of southern Alabama and Georgia. In Leon County water supply wells have penetrated 600 feet of limestone, the St. Marks Formation and the Hawthorn Formation. The Floridan Aquifer contains water under artesian and water table conditions depending on the thickness and permeability of overlying units.

The St. Marks Formation appears to have very little permeability, and most water in the formation is confined to solution channels. Wells penetrating open solution channels yield large volumes of water.

The Suwannee Limestone is the part of the Floridan Aquifer most often utilized as a source of groundwater. Large quantities of good quality water can be obtained from wells penetrating the cavernous zones. Wells penetrating one or two such zones usually yield enough water for domestic purposes; correspondingly large yields are obtained from deeper wells penetrating a greater number of permeable zones.

The Crystal River Formation is the oldest formation penetrated by water wells in Leon County. The top is marked by a cavity system similar to that occurring at the top of the Suwannee. Wells drilled into the formation have yielded large quantities of good quality water; however, they are seldom utilized because sufficient quantities of water are available at shallower depths.

The western portion of Leon County has not experienced the dissolution of carbonates that is characteristic of the remainder of the county. The St. Marks and Suwannee Limestones have been protected from solution attach by the thick overlying impermeable sediments. Well yields are considerably lower in the area.

Potentiometric Surface

The potentiometric surface is an imaginary surface representing the areal distribution of pressure head in an artesian aquifer. It represents the height at which water will stand in tightly cased wells penetrating the Floridan Aquifer. Where the aquifer is confined, the contours represent the artesian pressure head. Where unconfined, the contours represent the water table in the limestone. Water in the aquifer moves perpendicularly to the contours from high to low head levels. Pumping or recharge can alter the natural system by creating an artificial hydraulic gradient.

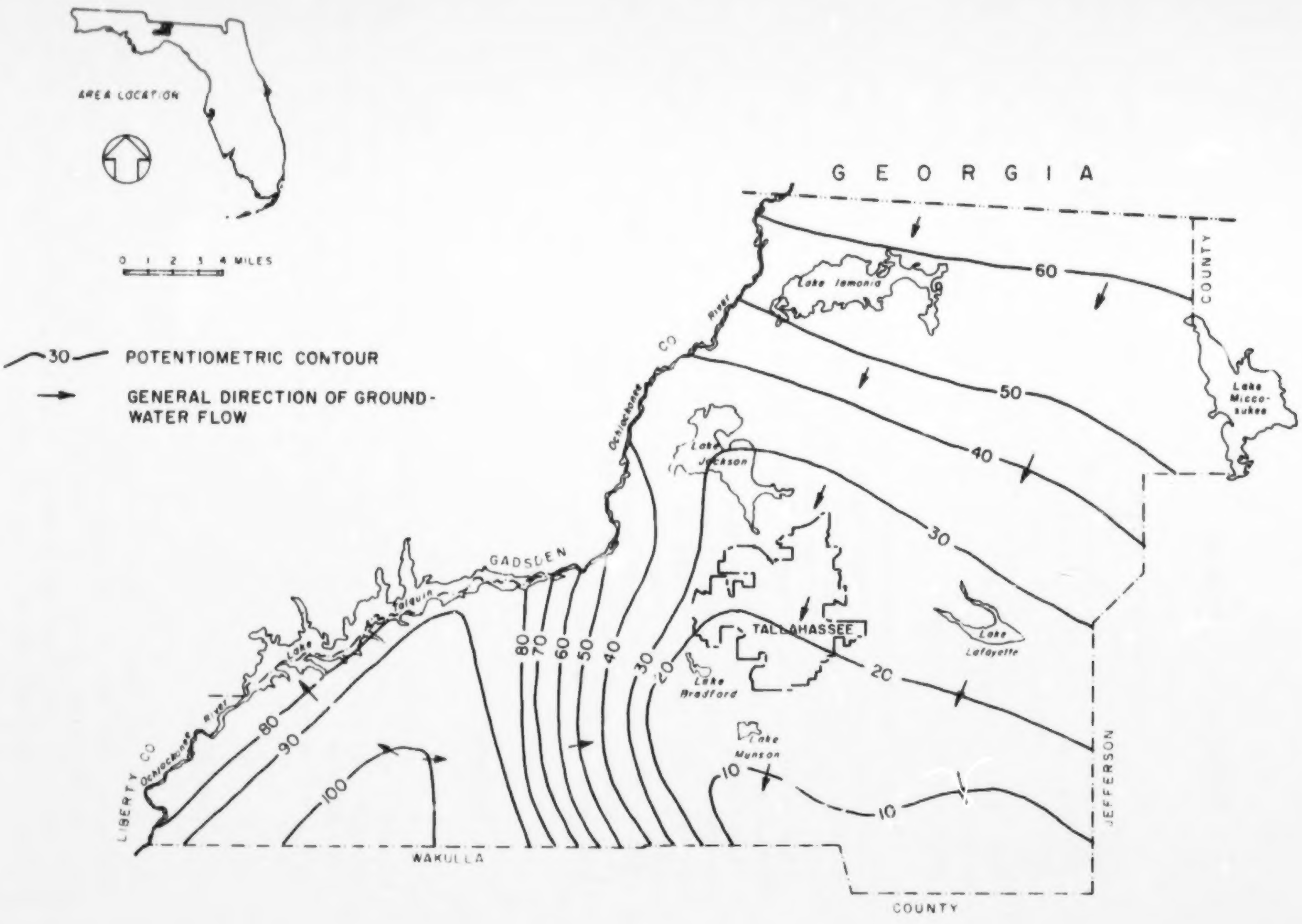
The potentiometric surface is shown on Figure IV.4 for Leon County. This is a generalized map only and is not meant to show the precise conditions prevailing locally. The high in the potentiometric surface in the southwestern part of the county is due to the low permeability of limestones in that area. Water movement in this area is slow and recharge is sufficient to maintain a head exceeding 100 feet. The re-entrant, or trough, in the piezometric surface which trends generally northward through Tallahassee results from the effects of spring discharge, particularly Wakulla Springs. The southward bending of the 40 and 50 foot contour lines in northeastern Leon County probably indicates that recharge is taking place in the Lake Miccosukee Basin. Likewise, the spreading of the 30 and 40 foot contours in east central Leon County indicates recharge taking place in the Lafayette Basin.

Recharge

The Floridan Aquifer is recharged by downward infiltration of water through the overlying beds, by water which reaches the aquifer directly through sinkholes, or by rain falling on its outcrop area. Recharge to the aquifer in Leon County is derived from rain which falls on Gadsden, Leon, and Jefferson Counties, and on adjacent areas in Georgia.

Discharge

Water is discharged by pumping from wells, natural flow from springs, and by evapotranspiration. The majority of pumping occurs in the Tallahassee area; the average daily withdrawal rate is 17 million gallons per day for Leon County. Loss by evapotranspiration is a relatively minor fraction of total discharge.


AREA LOCATION
0 1 2 3 4 MILES
30 POTENTIOMETRIC CONTOUR
GENERAL DIRECTION OF GROUND-WATER FLOW
GEORGIA
COUNTY
JEFFERSON
COUNTY
WAKULLA
LIBERTY CO
GADSDEN
CO
Ochlockonee River
Lake Talquin
Lake Iamonia
Lake Miccosukee
Lake Jackson
Lake Lafayette
Lake Bradford
Lake Munson
TALLAHASSEE
60
50
40
30
20
10
10
100
90
80
80
70
60
50
40
30
20

FIGU

SOURCE OF BASE MAP: State of Florida,
Department of Transportation

LEON COUNTY
POTENTIOMETRIC MAP

Water Level Fluctuations

The chief agents causing water level fluctuations in the Floridan Aquifer are rainfall variation, pumping, aquifer loading, atmospheric pressure changes, earthquakes, and tidal effects. The first two are by far the most important in terms of water supply. The discharge of water from the aquifer through springs maintains an area of relatively little water fluctuation in southern Leon County. The low permeability of the aquifer in the Apalachicola Coastal Lowlands also causes a stable area. Fluctuations of water levels in wells is greatest in the northern half of the county where recharge is greatest. In this area, the variability of precipitation is important.

Groundwater Utilization

The Floridan Aquifer provides over 95 percent of all water used in Leon County. The uses by category are public and private domestic supplies, irrigation, and industrial purposes. The City of Tallahassee is the biggest single user. Private wells penetrate the Floridan Aquifer for domestic supplies in areas outside the Tallahassee municipal water service area. Municipal wells are normally 16 to 20 inches in diameter and 250 to 450 feet deep. Private wells are generally less than 30 feet deep and only 2 to 8 inches in diameter. Irrigation and industrial needs for groundwater are quite small in Leon County. Some usage of groundwater is made for air conditioning, but this water is usually returned to aquifer after use. It is, therefore, not a significant consumptive use.

Groundwater Quality

The majority of the water obtained from wells in the Tallahassee area is of good quality without color, odor, or objectionable taste and relatively low in dissolved solids and hardness. The only parameter which has shown a few high readings is iron. These high levels occurred at the Lake Munson Well (not connected to the central water system) and at well 16 on Raymond Diehl Road. However, two other recent readings at the Lake Munson well have shown low iron concentration and when well 16 was set at a lower pumping rate, no iron was detected. In any event, iron is not a critical material and is not addressed in the Water Quality Standards. Chlorination is the only treatment process required prior to distribution.

7. AQUATIC SYSTEMS

Aquatic systems in the Tallahassee area can be categorized as two types: lentic (standing water systems) which include ponds, lakes and swamps, and lotic (flowing water systems) which include streams and rivers. The lake and pond systems are the predominant aquatic type within the Tallahassee area.

Aquatic faunal and floral components give good indications of the water quality in a given drainage basin. For the Tallahassee-Leon County area, however, good baseline data for this determination were lacking when the EIS began. Therefore, the Environmental Monitoring Program (EMP) of the Tallahassee-Leon County EIS was designed to supplement these data gaps. The primary emphasis of the EMP was to define existing water quality conditions within the study area. These data were then used to formulate and evaluate alternatives for the treatment of wastewater in the study area.

Five major aquatic components were considered in the EMP: water quality, fish, invertebrates, sediments, and periphyton. Each of these components was surveyed at 22 sampling stations and included the three major drainage areas in the Tallahassee area. Four sample sites were located in the Lake Jackson drainage, six within the Lake Lafayette drainage, and eight within the Munson Slough/Lake Munson drainage. These systems were intensively surveyed because they are located adjacent to population centers and are the most likely to have pollution problems. Four outlying sites were included because of land use patterns. The following discussion is a summary of the results of the EMP and more detailed information can be found in the Environmental Monitoring Program Segment I Draft Report Report (EIS, 1980).

Water Quality

Fifteen sites were sampled for water quality analysis. Study parameters included dissolved oxygen, pH, temperature, conductivity, turbidity, BOD, fecal coliform, fecal streptococci, ammonia, TKN, nitrate, nitrite, total phosphorus, grease, oil, and heavy metals. The results of these investigations indicate that pollution problems are drainage system or basin specific. Some of the parameters are relatively constant (heavy metals, conductivity) for the entire study area, but most results indicate pollution problems in specific basins.

The Lake Munson system was found to have the most serious problems in the study area. In general, many of the sites in this system had high turbidity, BOD, bacterial levels, nitrogen concentrations, and total phosphate levels. This system also had low dissolved oxygen levels. These values agree with past water quality studies and indicate that the sources of pollution cam from urban runoff and from effluent from the City of Tallahassee's treatment plants. The assimilative capacity of this system for nutrient loadings has been overextended.

The Lake Lafayette system has much higher water quality than the Lake Munson system. Some low dissolved oxygen levels were noted, but most other parameters indicated higher quality. Weems Pond had problems associated with phosphate indicating runoff problems. The upper reaches of this system are currently undergoing land use changes from development, and sediment loadings to this system could increase through runoff and loss of filtering wetlands.

The Lake Jackson system had higher water quality, and the main pollution problems seem associated with urban runoff. The outlying systems had the highest water quality with only minor problems.

Fish

The most detailed list of fish species found in the study area can be found in the 201 Plan and data collected by the Florida Game and Freshwater Fish Commission. Major analysis of the data for the lake systems of this area have not been completed by the time of this report. Indications are that the total fish fauna is typical of this region of Florida.

As part of the EMP, the tissues of the two major game fish (bluegill and large mouth bass) of these systems were examined for heavy metal concentrations. As the results indicate, tissue values are very low and in some cases below the level of detection. There was no age/concentration relationship which would indicate a long-term bioaccumulation of pollutants. Even though the sample size was low, no indication of health problems from the game fish of this area was found.

Invertebrates

Macroinvertebrates (invertebrates large enough to be retained by a 0.5 mm mesh sieve) were sampled from aquatic vegetation and benthic sediments. These animals are often used in water pollution assessment because they occupy all food and tropic levels, and communities will reflect water quality conditions. The results indicated that water quality conditions. The results indicated that water pollution is a widespread problem in much of the study area. While many of the sites had high diversity, most of these areas were dominated by tolerant and facultative species. Each of the three major drainage basins showed a general trend of increasing diversity and less dominance by tolerant species with increasing distance from Tallahassee. This pattern indicates the impact of non-point sources and land use. These studies indicate that the Lake Jackson system is somewhat cleaner than the Lake Munson and Lake Lafayette systems, which are dominated by pollution tolerant species. Only Black Creek was dominated by intolerant species and suggestive of high water quality.

Sediments

Benthic sediments were studies as part of the EMP because pollutants are often held in sediment layers for many years. The pollutants are then released into the system by bottom agitation, storm events and other physical and biological factors. The EMP results indicated high concentrations from nonpoint urban runoff and point source discharges for BOD, nitrogen forms, total phosphorus, and grease and oil for the Lake Munson system. The Lake Munson area also had high total metal concentrations as well as high soluble metal concentrations. The Lake Jackson and Lake Lafayette drainages also showed the effects from urban runoff. This pattern indicates the impact of non-point sources and land use. Areas subjected to higher siltation were found to have higher levels of nitrogen parameters, BOD and total phosphorus. The outlying systems had generally lower concentrations for each parameter.

Periphyton

As with the macroinvertebrates, periphyton species often give a good indication of water quality conditions. The type of species composition present in a given drainage area will show where water quality problems exist. The results from the EMP survey indicate that there are water quality problems throughout the study area. The Lake Munson drainage area seems to have the most serious and widespread problems. The Lake Jackson and Lake Lafayette systems are more polluted near the City of Tallahassee, but show dramatic improvements as distance from the city increases. This pattern indicates the impact of non-point sources and land use. The outer areas of these drainages have abundant aquatic vegetation and show the purifying function that wetlands provide. The outlying sites appear to be in moderate condition based on periphyton studies.

Summary

These studies indicate that the aquatic systems of the Tallahassee-Leon County study area are currently suffering from degraded water quality. While the problems are widespread, there are indications that there is a direct relationship to non-point pollution sources and point sources. The Lake Munson system seems to be in the worst condition. It seems likely that the major contributing factors to these problems are a result of urban runoff and effluents from water treatment plants.

8. TERRESTRIAL SYSTEMS

The descriptions of the terrestrial flora of the study area have received extensive work. However, the faunal characterization has been significantly underemphasized. The EIS Environmental Monitoring Program was designed so as to supplement the existing data base where it is insufficient.

Terrestrial Vegetation

The classification of the terrestrial vegetation has developed through a series of studies to a detailed mapping effort. The 201 Study (1), 208 Study (City of Tallahassee, 1977) (1), 208 Study (Tallahassee-Leon County Planning Department 1978) (2), and the EIS Environmental Monitoring Program-Segment II (EPA 1980) activities have all addressed vegetation.

The EIS field investigations of potential sprayfield areas were under taken with several goals in mind: 1) to provide detailed descriptions of vegetation communities by quantitative sampling; 2) to field truth vegetation maps and aerial photos; 3) to make observations concerning the presence of protected species or their potential habitats; and 4) to compare ecological features of potential sprayfield sites. Table IV.5 summarizes the characteristics of these sites and Figure II.12 shows the locations of the tracts examined.

The field investigations concluded that nine vegetation types were present in the potential sprayfield sites: longleaf pine-scrub oak; longleaf pine-scrub oak-wiregrass; longleaf pine-pasture; pine plantation; pine forest; oak-hickory forest; mixed hardwoods; wetlands; and open land. Longleaf pine-scrub oak-wiregrass forests were of high ecological value due to their scarcity and the presence of several endangered or threatened animal species. Mixed hardwood forests were of high ecological value due to their scarcity, high diversity, advanced successional maturity and good wildlife-habitat potential. Longleaf pine-scrub oak forests and the oak-hickory forests were of moderately high ecological value due to their high diversity, moderate successional maturity, and good wildlife-habitat potential. Pine plantation, pine forests, longleaf pine-pasture, and open land were of low to moderate ecological value due to their wide extent, low diversity, and limited wildlife habitat potential. Small, isolated wetland areas and ponds were located in some of the sprayfield sites and should be preserved due to their high ecological value and low suitability for land application methods.

No federally protected plants are known from the study area, but a number of state protected plants may be present. However, Florida laws protecting such plants specifically exempt activities concerned with utility operations from restrictions, although permits may be required.

Of the plants listed in Table IV.6, several protected species or groups were observed at potential sprayfield sites. Flowering dogwood was common in the oak-hickory and mixed hardwood forests of the northeast area and occurred in sampling transects 6 and 8. Rattlesnake fern (Botrychium Virginianum) was observed inthe mixed hardwood forest at transect 8, as was the American holly (Ilex opaca). Another holly, Ilex decidua, was sampled in the Longleaf Pine-Scrub Oak forest during transect 5. As seen in Table IV.6, proper habitat conditions existed at many of the potential sprayfield sites for other protected plants that were not observed. Hardwood forests of the northeast area were the most like-

TABLE IV.5

POTENTIAL SPRAYFIELD DISPOSAL AREAS

SITE (See Figure 2)	APPROX. AREA (Acres)	VEGETATION TYPES (% Area)* Open Land	Longleaf Pine-Scrub Oak	Longleaf Pine Scrub Oak-Wiregrass	Pine Forest	Pine Plantation	Longleaf Pine-Pasture	Oak-Hickory	Mixed Hardwood (Beech-Magnolia)	Wetlands
1. Southwest Sprayfield Expansion	1400	8	32	--	<1	59	--	--	--	--
2. East of Lake Munson	3200	4	--	83	-	13	--	--	--	--
3. Southeast Sprayfield Expansion	1300	3.5	--	7.5	1	85	--	3	--	--
4. North of Tram Road	1700	6	--	--	8	26	45.5	6	7.5	1
5. Northeast Sprayfield Sites	6450 (total)									
A.	620	45	--	--	8	--	--	40	7	--
B.	480	21	--	--	1	--	--	47	31	--
C.	600	67	--	--	--	--	--	31	2	--
D.	410	87	--	--	6	--	--	5	--	2
E.	1020	23	--	--	17	2	--	57	1	--
F.	360	41	--	--	3	7	--	48	--	--
G.	1750	58	--	--	2	6	--	29	4	<1
H.	760	53	--	--	20	--	--	20	6	1
I.	440	79	--	--	--	20	--	<1	--	--

*Vegetation percentages calculated from aerial photos and vegetation maps obtained from the Tallahassee-Leon Coun

TABLE IV.6

PLANTS FROM THE LEON COUNTY AREA WHICH ARE PROTECTED BY FLORIDA LAW

(Section 581.185--Florida Statues)

SPECIES OR GROUP	COMMON NAME	STATUS(1)	HABITATS
Aristolochia tomentosa	Dutchman's pipe	T	Rich woods
Asimina pygmaea	Pink pawpaw	T	Pinelands
Calycanthus floridus	Strawberry bush	T	Lowland hardwoods
Cercis canadensis	Redbud	T	Upland forests
Chionanthus virginicus	Fringetree	T	Upland forests
**Cornus florida*	Flowering dogwood	T	Upland forests
C. alterniflora	Alternate-leaf dogwood	T	Hardwoods
Erythronium americanum	Dogtooth Violet	T	Rich hardwoods
*FILICINEAE (Class)	Fern Families	T	Various
(All native species except *Osmunda* spp. and *Pteris aquilinum*)			
Gordonia lasianthus	Loblolly bay	T	Low woods
**Ilex* spp.	Hollies	T	Various
(All native species except *Ilex glabra*)			
Lilium catesbaei	Pine lily	T	Pine flatwoods
Lobelia cardinalis	Cardinal flower	T	Marshes, low wet woods
Magnolia ashei	Ashe's magnolia	E	Rich hardwood slopes
M. pyramidata	Pyramidal magnolia	E	Dense, rich woods
Malus angustifolia	Crabapple	T	Woodland borders, old fields
ORCHIDACEAE (Family)	Orchid Family	T	Various
(All native species)			
Pinckneya pubens	Fevertree	T	Low woods
Phapidophyllum hystrix	Needle palm	T	Wooded ravine slopes
Ribes echinellum	Miccosukee gooseberry	E	Rich hardwoods
Rhododendron austrinum	Orange azalea	E	Wooded ravine slopes
Rhododendron spp.	Azaleas	T	Various
(All native species except *R. austrinum* and *R. chapmanii*)			
Sarracenia spp.	Pitcherplants	E	Wetlands (marshes)
(All native species)			
Smilax smallii	Jackson vine	T	Rich woods
Zephyranthes atamasco	Atamasco lily	E	Low woods, wet meadows
Zephyranthes spp.	Zephyr lillies	T	Various
(All white-flowered species)			

(1) Status: T = Threatened; E = Endangered.

*Species identified in field investigations of potential sprayfield sites.

ly locations for the occurrence of protected plants within the study area.

A detailed description of vegetation field investigations is found in the Environmental Monitoring Program, Segment II - Terrestrial Survey task report (EIS, 1980).

Terrestrial Fauna

The definition and description of the wildlife in Leon County have been much less sophisticated than that of the vegetation. The level of effort involved has generally been restricted to species lists. This effort has been extended to habitat/wildlife associations only for protected or sensitive species.

Federal and state laws provide limited protection to certain rare species classified as endangered, threatened, or of concern. Table IV.7 lists protected animal species known from the Leon County area. Included is information regarding the status and preferred habitat of those species.

EIS field investigations showed that several protected animals are likely to occur within some of the potential sprayfield areas, although none of these species were seen during field investigations. In the southern sprayfield sites, proper habitat conditions were present for the occurrence of the gopher frog, indigo snake, gopher tortoise, red-cockaded woodpecker, and southeastern kestrel. The longleaf pine-scrub oak-wiregrass community was the most likely habitat for these species, and as previously mentioned, covered a large portion of the potential sprayfield site east of Lake Munson and a limited portion of the Southeast Sprayfield Expansion site.

The other protected animals listed in Table IV.7 are not likely to be present within the potential sprayfield sites. The Florida black bear is known to occur only within remote sections of the Apalachicola National Forest, where it is not considered threatened. Gray bats are not likely to occur in any of the potential sprayfield areas, since there has been only one isolated sighting of the species in Leon County and habitat needs are narrowly restricted to special cave habitats (Layne, 1979) not believed to be present in the study area. The remaining protected animals are typically found in wetland marshes, swamps, and ponds. Since wetlands were not considered to be suitable sites for wastewater disposal in this project, these habitats were largely removed from potential application sites during preliminary analyses.

9. ENVIRONMENTALLY SENSITIVE SYSTEMS

A number of ecosystems have been identified as being vulnerable to impacts of wastewater management systems or development or as providing

TABLE IV.7

PROTECTED ANIMALS KNOWN FROM LEON COUNTY

COMMON NAME (SPECIES)	STATUS(1)		PREFERRED HABITAT*
	STATE	FEDERAL	
Amphibians & Reptiles			
Florida gopher frog (Rana areolata)	SSC	-	Longleaf pine-scrub oak
American alligator (Alligator mississippiensis)	SSC	T	Wetlands, ponds
Gopher tortoise (Gopherus polyphemus)	SSC	-	Longleaf pine-scrub oak
Eastern indigo snake (Drymarchon corais couperi)	T	T	Longleaf pine-scrub oak
Mammals			
Gray bat (Myotis grisescens)	E	E	Caves
Florida black bear (Ursus americanus floridonus) (except in Apalachicola National Forest)	T	-	Dense forests, thickets, & swamps
Birds			
Red-cockaded woodpecker (Picoides borealis)	T	E	Mature pine forests (especially Longleaf P.)
Bachman's warbler (Vermivora bachmani)	E	E	Hardwood swamps, lowland forests
Southeastern kestrel (Falco sparverius paulus)	T	-	Open pine forests, clearings with dead trees
Little blue heron (Florida caerulea)	SSC		Wetlands, ponds
Snowy egret (Egretta thula)	SSC	-	Wetlands, ponds
Limpkin (Aramus guarauna)	SSC	-	Wetlands, ponds

*Habitat information obtained from Pritchard, P. (ed.) 1978. Rare and Endangered Biota of Florida. Vols. 1-4. Univ. Presses of Fla.: Gainesville.

(1) Status: T = Threatened; E = Endangered; SSC = Species of Special Concern.

habitat for threatened and endangered species. These ecosystems may be grouped in the following categories:

I. Lakes

a. Large Lakes: Iamonia, Jackson, Lafayette, Miccosukee and Talquin. The lakes are major natural resources in the area and are primarily sensitive to impacts from development and construction.

b. Small Permanent Lakes and Ponds: The study area contains numerous small lakes and ponds. These water bodies are sensitive to influences from development because of their size and limited assimilative capacity.

II. Wetlands

a. Freshwater Marshes: These systems are distinguished from the swamp system by the relative amount of grass-type vegetation. Marshes are dominated by grasses and sedges, while swamps have trees and shrubs as the dominant vegetative type. The fresh water marshes are critical habitats for the feeding and production of many species. They are limited in the area due to the sandy soils in the south and the relief of the Tallahassee Hills to the north.

b. River Swamps: The river swamps, such as along the St. Marks River, contain diverse hardwood species. Like the freshwater marshes, they represent important wildlife habitat. The river headwaters include subterranean drainage, and surface water flow is restricted to periods of high water tables.

c. Ephemeral Ponds: This category consists of the numerous small water bodies which are dry during part of the year. These ponds are important for several reasons, including their use as breeding and feeding areas for wildlife and their role in the surface hydrology of the area.

d. Branch and Creek Swamps: These systems generally include wet, spagnaceous woodlands that are periodically flooded but are on steep enough slopes to preclude excessive peat accumulation. The systems are restricted to the Tallahassee Hills.

III. Aquatic Subterranean Ecosystem

a. Caves: This ecosystem consists of cave communities inhabiting the underground water channels of the Woodville Karst Plain and the solution cavities underlying the Tallahassee Hills. This system is relatively unknown. Identified species include a blind crayfish (Procambarus orcinus), an amphipod, an isopod and a symbiotic branchiobdellid worm. Known sites include Gopher Sink, Culley's Cave, and Osgood Sink. The system is listed due to its limited distribution and the sensitivity of most cave organisms to pollution.

b. Open Sink Ponds: Sinks are created by the collapse of limestone cavities. Ponds formed in these sinks may have direct access to subterranean ecosystems. Three open sink ponds of particular interest are Big Dismal Sink, Little Dismal Sink, and Gopher Sink.

IV. Habitats for Protected Species (found in the following areas but not to include the entire area)

a. Sandhills: This area is characterized by sandy soils, an understory of turkey oak, and a dominance of longleaf pine. The habitat is primarily restricted to the Sandhill region of the Woodville Karst Plain. The area contains a wide variety of wildlife including the gopher tortoise, a threatened species.

b. Mature Pinewoods: The predominance of managed forest systems in the study area has severely limited the number of mature pinewood stands. The importance of this vegetative type is reflected in the dependence of the red-cockaded woodpecker, an endangered species, on its presence for nesting sites.

c. Southern Mixed Hardwoods: These forests represent the climax community for the study area. All existing stands have been selectively cut for timber production. Existing stands were identified along I-10 west of Meridian Road and along the Cody Escarpment. Such forests provide habitat for a number of plant and and animal species near the southern limit of their ranges. Many of these species are considered threatened or endangered in Florida.

V. Steepheads and Other Ravines

Steepheads occur in the eastern valley wall of the Ochlockonee River and are caused by surface erosion. Neither development nor wastewater management systems are expected to be extended that far west during the design period. Steepslopes and smaller ravines in the Tallahassee Hills area are sensitive to development, and their disturbance has resulted in siltation and erosion problems.

VI. Floodplains

Floodplains occur primarily on mature rivers located on terrains with a low gradient. Inherent within the floodplain is its ability to mitigate flood damages by lowering the river velocity. This occurs as the river overflows its banks and begins to spread out over the floodplain. Another of its important features is that it provides storage for the flood waters which will then gradually recede.

The problem develops as the community expands and begins to develop the floodplain. Structures on the floodplain not only run the risk of damage by flood but reduce the storage capacity of the floodplain, as well. The net result being that a portion of land upstream from the encroachment is likely to become inundated by a river stage that never before threatened it.

10. NONPOINT SOURCE POLLUTION

Nonpoint source pollution refers to nondiscrete and diffuse inputs or loadings which are usually associated with rainfall events and are associated with both natural processes and human activities. The purpose of this section is to review the nonpoint source data collected from recently conducted studies. It provides the information base for determining the secondary impacts of nonpoint pollution generation.

Nonpoint pollution sources have been grouped into six categories for the Tallahassee-Leon County study area. These categories include: atmosphere, vegetation, urban areas, construction activities, agriculture-silviculture activities and solid waste disposal sites. These source categories are discussed below as to their importance in the study area, the pollutants produced and the effects of the pollutants.

Atmosphere

Rainwater begins to accumulate pollutants from the atmosphere prior to the addition of nonpoint pollutants from solid surfaces. This atmospheric accumulation can be significant as witnessed by the "acid rain" associated with gross air pollution. In Florida, heavy metals, nitrate, nitrite, ammonia and chloride have been found to occur in high percentages in both sediments and stormwater runoff.

Vegetation

Vegetation, either natural or cultivated can have a significant impact on water quality. Natural stream systems depend on terrestrial vegetation input as their primary energy source. Vegetative components of nonpoint source pollution can also be associated with managed systems. Agriculture and silviculture activities can produce major inputs of vegetation. Residential areas are also major nonpoint sources due to the extremely high energy requirements associated with lawn upkeep. This energy subsidy yields nonpoint pollution in the form of nutrients (fertilizers), pesticides and vegetative biomass (grass).

Urban Areas

A large number of factors contribute to the importance of urban areas as a source of nonpoint pollution. Of primary importance among these factors is the predominance of impervious surfaces in urban settings. These include roads, parking lots, and rooftops and produce greater amounts of stormwater discharge at faster rates than vegetative areas. These conditions can produce erosion and sedimentation problems.

The use of motor vehicles in urban areas produces significant nonpoint source pollutants. These pollutants include a) leakage of fuel, lubricants, hydraulic fluids, and coolants, b) fine particulates from tire, clutch and brake wear, c) particulate exhaust emissions and d) vehicle components broken by vibration or impact.

Additional nonpoint pollution originates from litter. The extent of this problem is graphically illustrated by the shoreline of Lake Munson, which receives the nonpoint runoff from a significant portion of Tallahassee.

Animal wastes (household pets) contribute a significant amount of nonpoint source pollution from urban areas.

Industry can contribute pollutants through both direct runoff and atmospheric dispersal. Industrial sources are not a major concern in the Tallahassee area. The most nonpredictable nonpoint source is associated with spills. Spills are usually caused by transportation accidents (i.e. trucks or railroads). The lengthy system of ditches utilized to transport urban runoff in the Tallahassee area establishes the routes that most spill pollution will follow. The system discharge for most of the Tallahassee area will terminate in Lake Jackson, Lake Munson, or Lake Lafayette.

Construction

The nonpoint pollution associated with construction is primarily due to sediment loading. The erosion control procedures used during the construction of Interstate 10 were only partially effective in preventing suspended sediment losses from highway rights-of-way. The suspended sediments contained large amounts of total phosphorus and silicon which contributed to the eutrophication of downstream water bodies. Suspended silt and clays were deposited on stream and lake bottoms with resulting losses in benthic diversity and production and fish production.

Agriculture-Silviculture

The extensive management involved in agricultural systems is a significant source of nonpoint pollution. Agricultural activities can produce large loadings of sediments, nutrients and pesticides. Active agriculture in the form of row crop production is extremely limited in the Tallahassee area. The agricultural lands in the study area are classified "agriculture" or "undeveloped land" by the Tallahassee-Leon County Planning Department (1979). Most of these areas consist of St. Joseph Paper Company lands or are contained in a series of large plantations. Most of these lands are used for silviculture, grazing or game preserves.

Solid Waste Disposal Sites

Very serious nonpoint source pollutants can be derived from waste disposal sites. These wastes include heavy metals, pesticides, toxics and sediments. Solid waste disposal in the Tallahassee area has recently been centralized to one facility south of the Lake Lafayette system. Precautions were taken in the design and construction of this facility to minimize nonpoint source pollution. Monitoring is being conducted in Lake Lafayette and in test wells surrounding the site. The current solid waste disposal site is not expected to produce significant levels of nonpoint source pollution.

Several recent studies of nonpoint pollution have been conducted in the Tallahassee-Leon County EIS study area. These studies have all dealt with the Lake Jackson and Lake Munson drainage basins. They were primarily concerned with the effects of sediment pollution caused by the construction of Interstate 10 near the lower end of Meginnis Arm. Based on this information, a significant effort was made in the Tallahassee-Leon County Area-wide Waste Treatment Management Study (208) to assess and describe the nonpoint source problem in the Lake Jackson and Lake Munson drainage basins (Tallahassee-Leon County Planning Department, 1978) Another study, the Lake Munson Drawdown Analysis (EPA, Case Study File, 1977) 1978) did not specifically deal with nonpoint source pollution; however, it did provide important related information, particularly in reference to heavy metals. Supporting investigations were carried out as part of the Tallahassee-Leon County EIS Environmental Monitoring Program (EPA, Segment I, 1980) These studies are further summarized below.

Lake Jackson Investigations

A significant investigation of nonpoint source pollution in the Tallahassee area was conducted. Three watersheds were selected in in order to compare the relative effects of urbanization on nonpoint source pollution. The watersheds selected were of urban (Meginnis Arm), suburban (Fords Arm), and forest agriculture (Ox Bottom Creek) land use patterns.

Conclusions from the study indicate that increasing levels of urbanization produces 1) increased overland flow and increased peak stream discharge; 2) increased total volume of discharge over a much shorter time span; 3) increased mean concentrations of dissolved solids (TDS), nitrate-nitrogen, and ammonia-nitrogen under *all* streamflow conditions in both the urban and suburban watersheds; 4) decreased mean concentrations of dissolved silicon, and orthophosphate-phosphorus under *all* streamflow conditions in both the suburban and urban watersheds; 5) decreased mean concentrations of suspended solids under *low* streamflow conditions but dramatically increased mean concentrations of suspended solids under *high* streamflow conditions; 6) increased variability in the composition of streamwaters under *all flow conditions*; 7) increased export rates of all dissolved (except silicon) and suspended constituents during storm events and, therefore, increased relative significance of storms as transport mechanisms. A separate consideration of the Lake Jackson Investigation was the effect of highway construction (Interstate 10) on lake quality. Results indicated that the construction contributed a significant amount of sediments to downstream ecosystems despite extensive use of erosion controls. (Burton et al. 1976, 1977, 1978; Harriss et al., 1974; Turner et al., 1974)

The initial report included three recommendations for additional watershed management research:

1. The effect of small and large ponds (including settling basins) on the dissolved nutrient export from selected subwatersheds of Lake Jackson should be determined.

2. The dissolved and particulate solids loading rate (mass/unit area/year) of small subwatersheds in single-category urban land use, e.g., low density residential, should be determined for representative land uses.

3. The respective effects of grassy swale, paved ditch and curb-gutter street drainage systems on water, dissolved and particulate solids loading of tributaries to Lake Jackson should be determined.

208 Nonpoint Study

The 208 nonpoint (Tallahassee-Leon County Planning Department, 1978) study consisted of sampling in the Lake Jackson and Lake Munson drainage basins during July-August, 1976, and February, 1977. The sampling program was designed to develop mass loadings for for several land use categories including commercial and institutional high density, medium density, low density, and loadings resulting from construction of a single family residential subdivision. In addition, the effectiveness of nonpoint source pollution control measures was investigated. Results pointed toward the ineffectiveness of settling ponds in removing silts and clays, nitrogen and phosphorus during storm events and increased runoff due to pavement in urban areas.

The study concluded that stormwater runoff volumes, flowrates and velocities from urbanized areas of similar topography, soil types, and ground cover. This accelerated runoff is the major cause of erosion in the secondary and primary drainage system. In addition, 75 percent of the total mass export of suspended solids, total nitrogen, total phosphorus, total organic carbon, and waterflow was determined to be directly related to the volume of stormflow from that basin.

Lake Munson Drawdown Analysis

A study of water quality and sediment composition was conducted from February through December, 1976, at four sites in Lake Munson. This effort was made in order to document the effect of a full scale drawdown on Lake Munson. The 208 Technical Task Force proposed the drawdown in order to stabilize the lake bottom, establish rooted vegetation, provide improved breeding area for fish and potentially improve rates. While this study is not specifically a nonpoint source investigation, the project did provide background information on the sediment heavy metal concentrations. Total and soluble heavy metals tests were run for chromium, cadmium, lead, copper, iron and zinc. The highest metal concentrations were found near the inflow and sediment plume of the lake. Metals related to traffic, such as zinc, lead, chromium and copper, could have found their way to the lake via runoff from roadways. High iron contents were the result of clay particles in the silt plume (EPA, Case Study File, 1977).

EIS Environmental Monitoring Program (EMP)

While the EMP was not a nonpoint source study, certain aspects of the program provided background data on nonpoint source pollution. The aquatic section of the EMP includes periphyton, microinvertebrate, water quality sampling, and sediment analysis. In addition, the EMP included an assessment of the impact of heavy metals on fish species (EPA, Segment I, 1980).

PART C. EXISTING MAN-MADE ENVIRONMENT

1. POPULATION

Existing Population

Tallahassee and Leon County have experienced steady growth over the past 50 years, as shown in Table IV.8.

TABLE IV.8
TALLAHASSEE AND LEON COUNTY POPULATION, 1930-1980

	TALLAHASSEE		LEON COUNTY	
Year	Population	Avg. Annual Increase (%)	Population	Avg. Annual Increase (%)
1930	10,700	-	23,476	-
1940	16,240	5.2	31,646	3.5
1950	27,237	6.8	51,590	6.3
1960	48,174	7.7	74,225	4.4
1970	72,586	5.1	103,047	3.9
1980	81,548	1.2	148,655	4.4

Source: U.S. Department of Commerce, Census Bureau, 1980.

The primary factor in population growth has been in-migration. The sunbelt states in general and Florida in particular have experienced significant population increases over the last two decades. As south and central Florida become more densely populated, northern Florida is beginning to absorb more of the state's population growth. Tallahassee is the state's capital, and increased opportunities for government employment have resulted in in-migration. The City is also the site of Florida State University and Florida A & M University, where enrollments have risen substantially over the last 15 years.

The trend has been to expand the size of the Tallahassee urbanized area beyond its incorporated borders. This can be seen by the fact that the total County population which lies within the incorporated area of Tallahassee has decreased from 70.5 percent in 1970, to an estimated 63.0 percent in 1975 and to 54.9 percent in 1980.

Future Population

Projections of Leon County population indicate that between now and the year 2000, the average annual growth rate at 2.5 percent to 3.0 percent will approximate that of the state. Population projections have been made by both the Tallahassee-Leon County Planning Department (TLCPD) and the Bureau of Economic and Business Research (BEBR) at the University of Florida at Gainesville. Table IV.9 shows those projections used for the 201 and 208 Studies as well as the more recent figures generated by TLCPD for the 1977 Comprehensive Plan.

TABLE IV.9
POPULATION PROJECTIONS FOR LEON COUNTY

Source	Publ. Date	Study Name	1980	1985	1990	1995	2000
TLCPD	1975	201	143,000	168,200	192,100	217,200	259,000
BEBR	1975	208	161,800	187,300	212,000	-	258,400
TLCPD	1977	Comp. Plan	149,480	168,214	192,113	217,200	239,034

Source: Tallahassee-Leon County Planning Department, 1978.

The U.S. Environmental Protection Agency and the Florida Department of Environmental Regulation have agreed that the EIS will use the 1977 population projections generated by TLCPD, and the 1980 final Census figure for Leon County of 148,655 tends to confirm the accuracy of the TLCPD 1977 estimate. The use of the most recent TLCPD projections is significant because the projected population in the year 2000 includes 20,000 fewer persons than was planned for in the 201 Wastewater Facilities Plan.

Given the areas of available land in Leon County and the location of major highways serving the County, most of the future population growth is anticipated to occur north and east of the present urban area. However, when the two sets of data are compared to determine where the 20,000 person differential occurs, the areas to the north and east of the City will not receive as much population growth as has been predicted in the 1975 TLCPD projections.

2. LAND USE

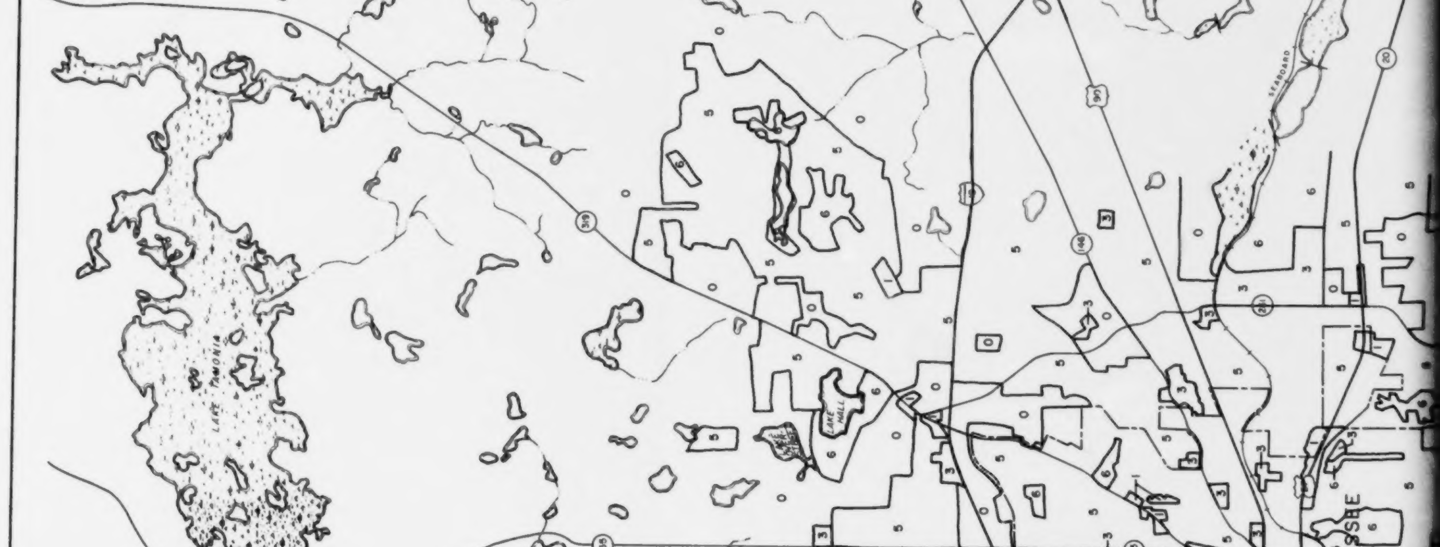
Leon County contains 671 square miles or 429,440 acres of land and water bodies. Tallahassee is the only incorporated municipality in the County, and its corporate limits encompass approximately 26 square miles or 4.0 percent of the County. Developed land accounts for 35,644 acres or only 8.3 percent of the County, as shown in Table IV.10 and Figure IV.5.

Following World War I, urbanization occurred in roughly concentric circles from the old residential areas surrounding the capitol and Central Business District. During the 1960's and 1970's, residential development spread outside the Capitol Circle/I-10 urban area boundary more rapidly in a northerly and northeasterly direction than in other directions. This pattern is attributable largely to the fact that the Apalachicola National Forest and the St. Joseph Paper Company land holdings currently block expansion of development into southern portions of the County.

TABLE IV.10
EXISTING COUNTYWIDE LAND USE

Land Use	Acres	Percent of Total Land
Residential	18,938	4.41
Commercial	2,276	.53
Industrial	644	.15
Institutional	2,233	.52
Open Space	1,890	.44
Agriculture	1,761	.41
Transportation/Utilities	773	.18
Rights-of-Way	7,129	1.66
Water Bodies	15,629	3.64
Appalachicola National Forest	103,500	24.10
Vacant	274,255	63.91
TOTAL	429,440	100.00

Source: Tallahassee - Leon County Planning Department. Comprehensive Plan, "Trends to the year 2000". Draft, 1979. And interview with Ken Davis, TLPCD staff, June 18, 1979.

N
LAKE IAMONIA
LAKE JACKSON
LAKE HALL
LAKE ELLA
LAKE LAFAYETTE
LAKE CASCADE
OCHLOCKONEE RIVER
SEABOARD COAST LINE
TALLAHASSEE
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261
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371
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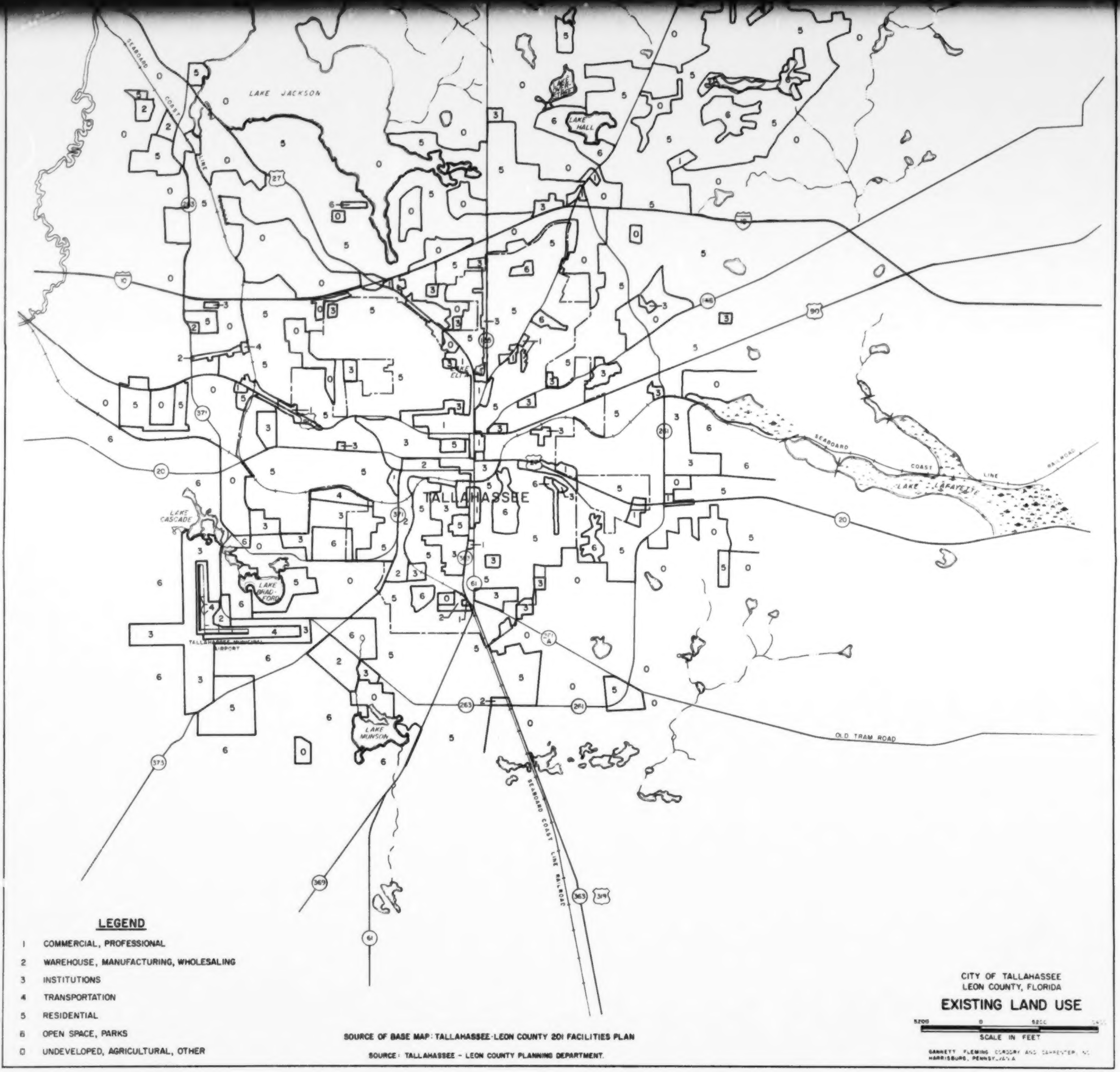
LAKE JACKSON
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TALLAHASSEE
LAKE CASCADE
LAKE BRADFORD
TALLAHASSEE MUNICIPAL AIRPORT
LAKE MUNSON
LAKE LAFAYETTE
SEABOARD COAST LINE RAILROAD
OLD TRAM ROAD
10
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90
146
261
263
363
319
369
373
61
SCALE IN FEET
5200
0
5200

LEGEND

- 1 COMMERCIAL, PROFESSIONAL
- 2 WAREHOUSE, MANUFACTURING, WHOLESALING
- 3 INSTITUTIONS
- 4 TRANSPORTATION
- 5 RESIDENTIAL
- 6 OPEN SPACE, PARKS
- 0 UNDEVELOPED, AGRICULTURAL, OTHER

SOURCE OF BASE MAP: TALLAHASSEE-LEON COUNTY 201 FACILITIES PLAN

SOURCE: TALLAHASSEE - LEON COUNTY PLANNING DEPARTMENT.

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

EXISTING LAND USE

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE IV 5

Residential areas are comprised predominantly of single-family homes. The largest recent concentrations of single-family homes have been in Killearn, Woodgate, and the Hartsfield Road areas. Apartments have clustered in close-in neighborhoods around Florida State University, the John Knox/Meridian Roads area, south of the Capital City Country Club, and near Apalachee Parkway.

Commercial land uses support activities for a 20-county trade area in northwest Florida and south Georgia. Such activities are concentrated mainly in the Central Business District, in 14 shopping centers, and along three corridors of strip development: North and South Monroe Street, West Tennessee Street, and Apalachee Parkway.

Ten office parks, all completed since 1971, contain approximately one-third of the office space inventory. The Central Business District accounts for approximately 50 percent, and the remainder is located in scattered individual office buildings.

Tallahassee-Leon County has 15 industrial park developments, the majority of which are located in the urban area. Eleven of the 15 parks have been completed since 1972. The industrial parks occupy 574 of 644 acres of industrial land in the county and are concentrated mainly in the southern and western portions of the urban area.

Large institutional land holdings include Florida State University (343 acres), Florida A & M University (270 acres), Tallahassee Community College (64 acres), and Lively Vocational-Technical School (51 acres). The public school system owns an additional 610 acres.

Parks and open space account for almost 2,000 acres in the County. This land use category does not include the Apalachicola National Forest, which is largely undeveloped.

Undeveloped land in Leon County accounts for 393,796 acres or 91.7 percent of total land. Water bodies occupy 15,629 acres of this acreage, with 378,167 acres remaining. The largest single undeveloped land holding is the Apalachicola National Forest, which contains 103,500 acres. The great majority of the remaining undeveloped land is zoned agriculatural. St. Joseph Paper Company owns 54,407 of these 274,667 acres. Much of the remainder is contained in a series or large plantations that account for over 166,000 acres and range in size from several hundred to several thousand acres. Most of these larger plantations are used for silviculture, grazing or game preserves.

The Tallahassee-Leon County Planning Department has made land use projections based on the assumption that no major change will occur in prevailing community values, which were determined by a series of surveys and forums during the 1970's. Given a 1976 population estimate of 135,377 and developed land comprising 35,644 acres (55.6 square miles), slightly over one-quarter (.26) acre of developed land is allocated per person. Using this ratio and a year 2000 population projection of 239,034, there will be a requirement for 63,105 acres (98.6 square miles) of developed land. Table IV.11 and Figure IV.6 show existing and future developed acreage requirements by land use category.

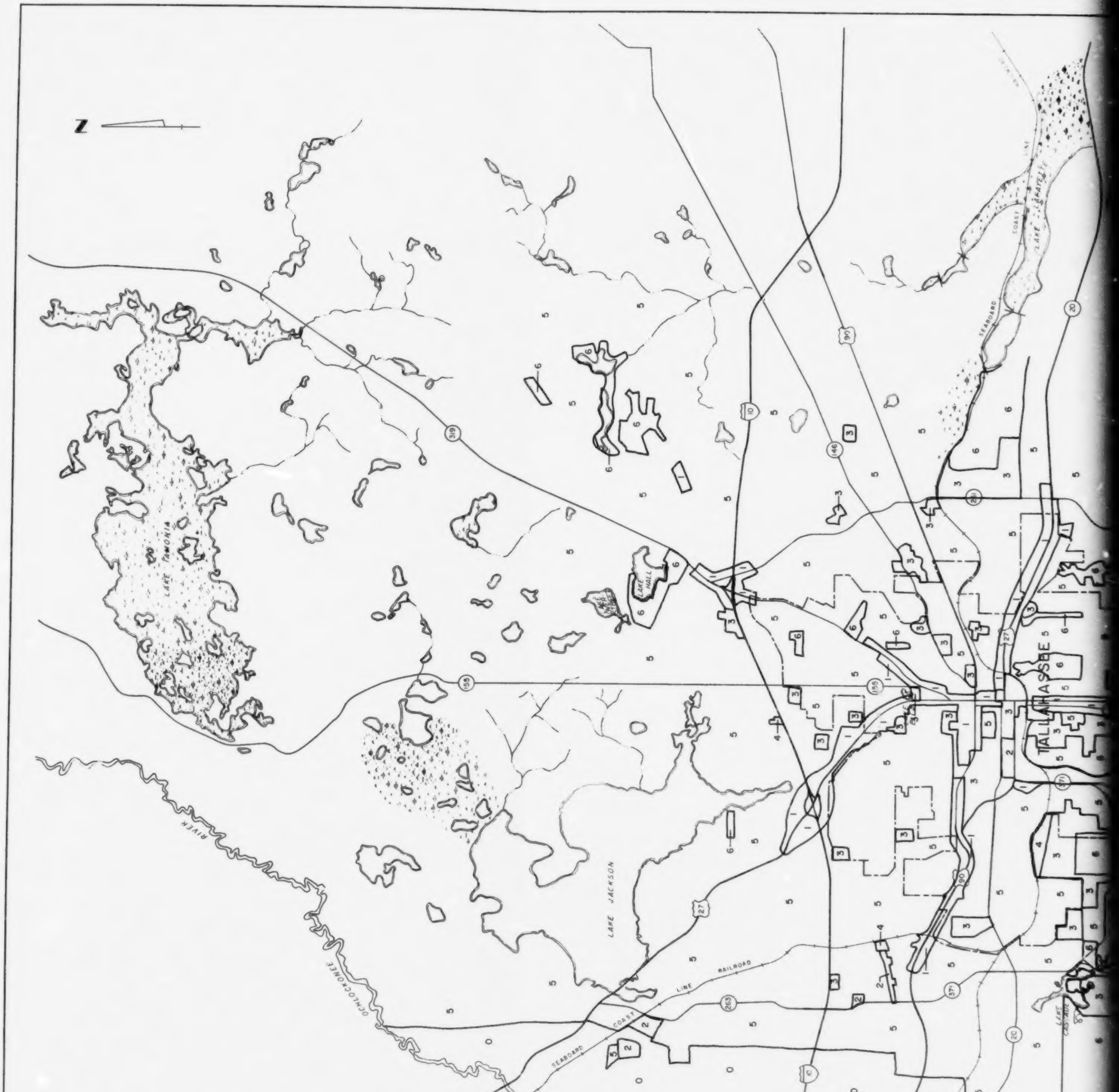
TABLE IV.11

EXISTING AND PROJECTED DEVELOPED LANDS IN LEON COUNTY

Land Use Category	1976 Acreage	1976 Acres Per Person	Year 2000 Acreage*
Residential	18,938	.140	33,465
Commercial	2,276	.017	4,064
Industrial	644	.005	1,195
Institutional	2,233	.016	3,825
Open Space	1,890	.014	3,346
Agricultural	1,761	.013	3,107
Trans./Utilities	733	.006	1,434
Right-of-Way	7,129	.053	12,669
TOTAL	35,644	.264	63,105

*Estimated year 2000 population of 239,034 times 1976 acres/person.

Source: Tallahassee-Leon County Planning Department. Comprehensive Plan. "Trends to the year 2000". 1979.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LAKE IAMONIA
LAKE JACKSON
LAKE HALL
OCHLOCKONEE RIVER
TALLAHASSEE
SEABOARD COAST LINE RAILROAD
SEABOARD COAST LINE
LAKE LAFAYETTE
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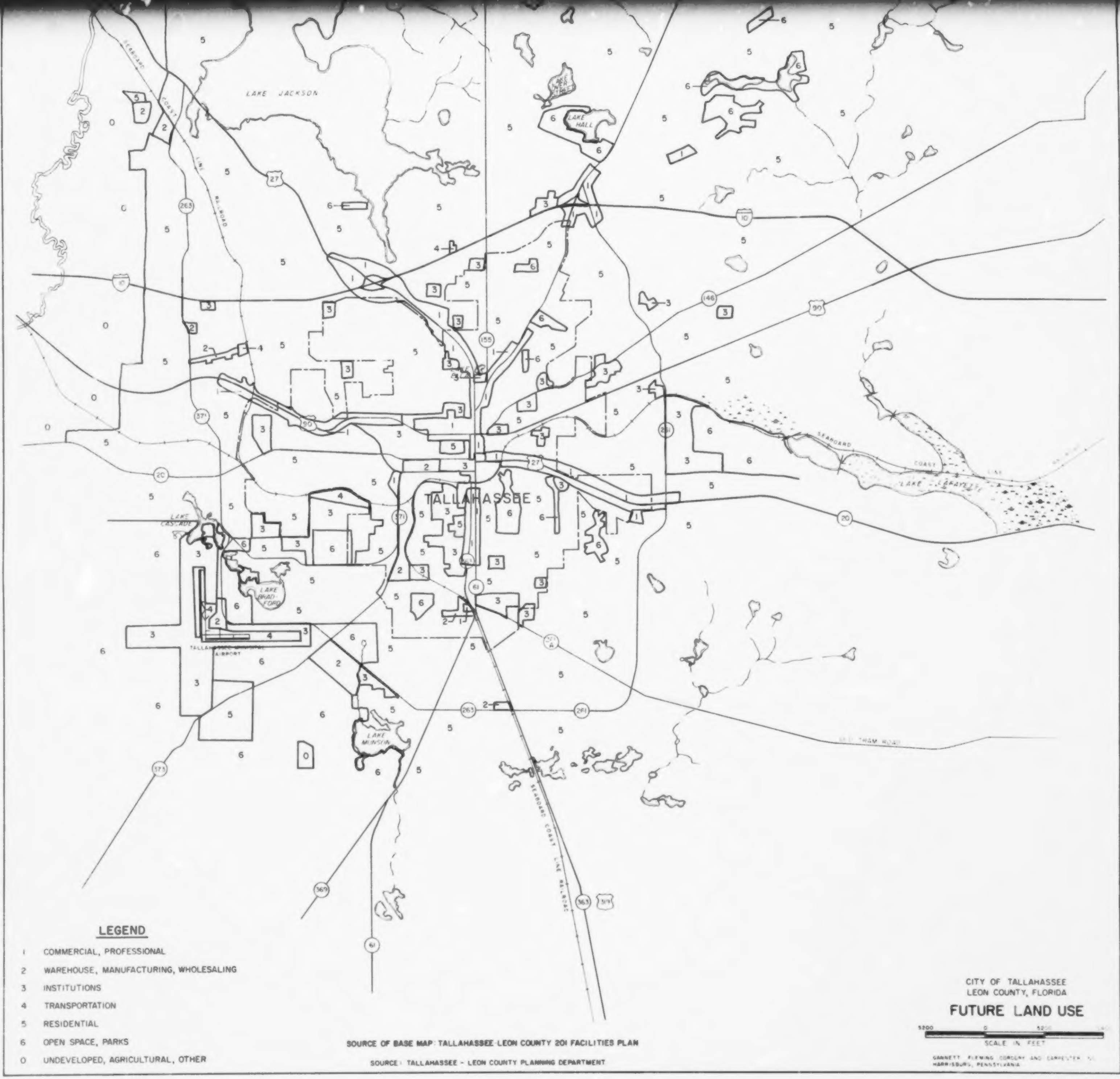

LAKE JACKSON
LAKE HALL
TALLAHASSEE
LAKE CASCADE
LAKE BRADFORD
LAKE MUNSON
LAKE LAFAYETTE
TALLAHASSEE MUNICIPAL AIRPORT
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OLD TRAM ROAD
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5200
SCALE IN FEET

LEGEND

1 COMMERCIAL, PROFESSIONAL
2 WAREHOUSE, MANUFACTURING, WHOLESALING
3 INSTITUTIONS
4 TRANSPORTATION
5 RESIDENTIAL
6 OPEN SPACE, PARKS
0 UNDEVELOPED, AGRICULTURAL, OTHER

SOURCE OF BASE MAP: TALLAHASSEE-LEON COUNTY 201 FACILITIES PLAN

SOURCE: TALLAHASSEE - LEON COUNTY PLANNING DEPARTMENT

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA
FUTURE LAND USE

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE IV 6

Considerable vacant land still exists within the urban area, that is within the Capital Circle/I-10 perimeter. The TLCPD will encourage a policy of filling in all quadrants not just inside the City limits but also inside the perimeter route. In addition, TLCPD records show approximately 13,000 lots platted for future single-family homes: 7,466 (58.0 percent) in the northeast; 2,747 (21.4 percent) in the northwest; 939 (7.3 percent) in the southeast; and 1,710 (13.3 percent) in the southwest.

In the northeast quadrant, four subdivisions are expected to absorb substantial growth during the next decade. A total of 4,509 unbuilt lots are distributed among Killearn Lakes (1,917), Killearn Acres (1,424), Killearn Estates Expansion (919), and Lafayette Oaks (245).

In addition, residential construction is anticipated in the Old Bainbridge Road area toward the northwest, along I-10 between Meridian Road and Thomasville Road, in the Governor's Square Mall area, and around the Lake Bradford Area. At a later date, residential development is expected to take place on the Colin English property inside the Capital Circle in the southeast quadrant, along Blountstown Road to the west of the City limits, and in the unincorporated communities of Chaires, Capitola, Woodville, and Miccosukee.

It is difficult to forecast when any of the plantation lands contiguous to the urban fringe will be sold for development. Some properties have been subdivided among heirs or corporations, or both. By the year 2000, Love Ridge Plantation, the Wilson property, the Mettler/Powerhouse lands, and the Humphrey/Woodfield Springs property may become available for development.

The increase in multifamily unit construction, which began in the early 1970's is expected to continue. These units will be confined largely to the urban area. The increase in mobile home living will also continue in the southern and western sections of the study area as a response to spiraling land and construction costs.

The Economic Base Study for Tallahassee-Leon County (Economic Research Associates, 1976) projects the need for additional retail acreage at 184 acres between 1981 and 1985, 190 acres between 1986 and 1990, and 207 acres between 1991 and 1995. Another 215 acres would be needed between 1996 and 2000 (EIS Study estimate). Four percent is allocated to the Central Business District, 50 percent to shopping centers and the remainder to strip commercial corridors and scattered locations. The remaining 992 acres of commercial land use would be required by private office space, government office space, and commercial service. A major focus of future commercial development will continue to be the I-10/Thomasville Road interchange.

Less than half of the 575 acres of industrial parks is currently developed. The current inventory of industrial zoned land in the County is 1,779 acres. Projected demand for industrial land would require one-third of the available inventory. Therefore, no rezonings are anticipated in this land use category.

3. ECONOMIC CONDITIONS

Leon County is primarily a government, trade, and service center. Its employment profile shown on Figure IV.7 indicates that 50.8 percent of nonagricultural employment is in government, reflecting Tallahassee's status as the state capital. Approximately 20.3 percent of the nonagricultural employment is in wholesale and retail trade. The third larges employment sector is services, which records 12.9 percent of the total nonfarm employment, and is attributable to the presence of Florida A & M University, Florida State University, and Tallahassee Community College in the study area.

Manufacturing industries account for a relatively small part of employment opportunities in the County. Printing and publishing, food and kindred products, concrete products, and lumber and wood products dominate manufacturing activity in the area. Table IV.12 shows projected employment by sector. As in the past, the major influence in the employment base will be in the government, trade, and service sectors. By 1995, it is estimated that these three sectors together will account for 72 percent of the total number of employees in the County (Economic Research Associates, 1976).

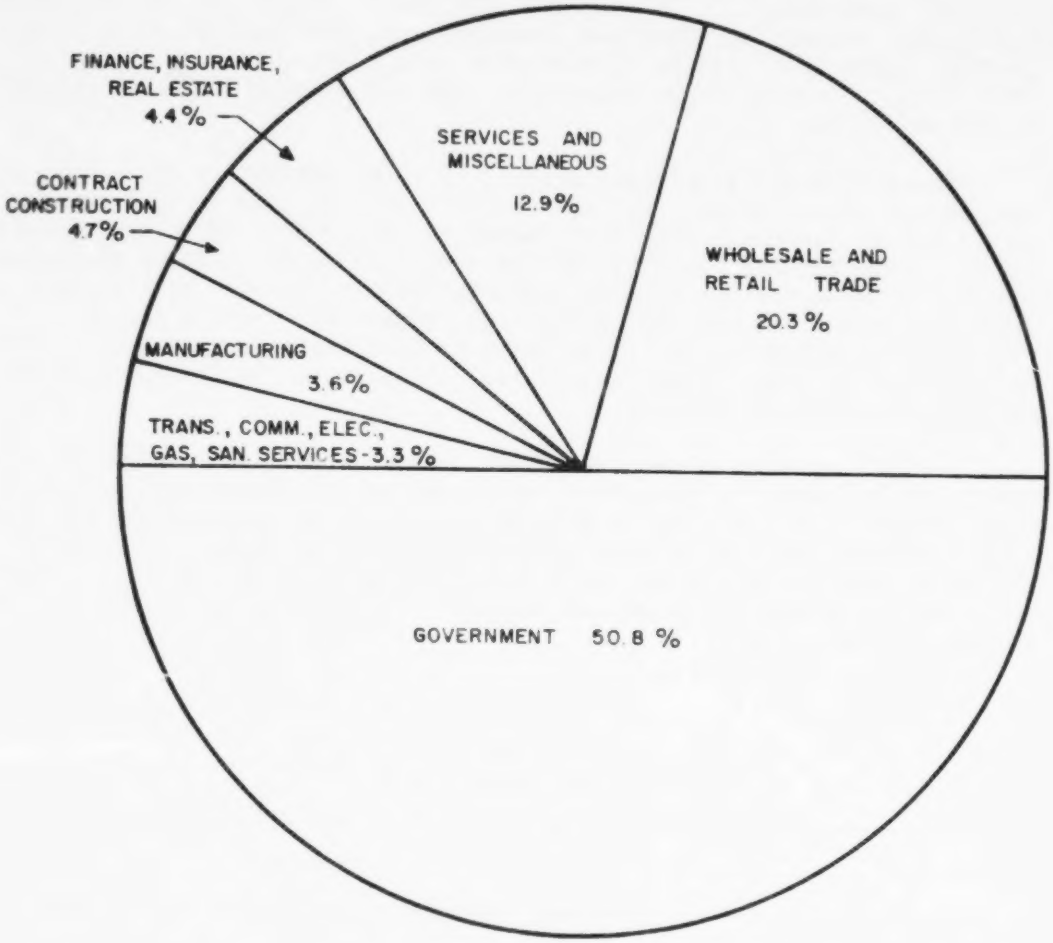
Income analyses from the 1980 Census are not yet available, but Table IV.13 shows a numerical comparison of 1970 household incomes in Leon County, in Florida, and in the nation. The City and County have large numbers of professional and white collar employees. This factor, combined with a high incidence of working wives, yields one of the highest average household incomes in Florida. This statistic is expected to be true in 1980 also.

TABLE IV.13
INCOME BY HOUSEHOLDS, 1970

Income	Leon County	Florida	U.S.A.
Less than $3,000	11%	25%	23%
$3,000-5,999	19%	22%	17%
$6,000-9,999	26%	23%	24%
$10,000-14,999	23%	17%	21%
$15,000-24,999	25%	9%	12%
$25,000-Over	6%	4%	3%
Median Income	$ 8,961	$ 8,267	$ 9,586
Mean Income	$10,615	$10,120	$10,930

Source: Tallahassee-Leon County Planning Department.

In summary, Leon County has an established base of service industries and a well-educated labor force. These assets enable the Tallahas-



SOURCE: FLORIDA DEPARTMENT OF
COMMERCE, 1978 ANNUAL AVERAGE

1978 ANNUAL AVERAGE NONAGRICULTURAL EMPLOYMENT BY INDUSTRY TALLAHASSEE SMSA

FIGU

TABLE IV.12
LEON COUNTY EMPLOYMENT PROJECTIONS BY SECTOR

Sector	1980	1985	1990	1995
Agriculture	600	600	600	600
Contract Construction	5,100	6,000	6,500	7,100
Manufacturing	2,900	3,500	4,400	5,600
Transportation, Communication, Public Utilities	2,600	3,100	3,500	4,100
Trade	13,200	14,300	15,700	17,200
Finance, Insurance, Real Estate	4,100	4,800	5,500	6,300
Services	7,300	9,300	11,200	13,400
Government	36,000	43,500	51,000	58,100
Other*	8,900	9,900	10,300	10,700
TOTAL	80,700	95,000	108,700	123,100

*Includes self-employed, unpaid family and domestic workers.

Source: *Economic Base Study Summary for Tallahassee and Leon County, April, 1976.* Economic Research Associates.

see- Leon County area to weather the cyclic fluctuations that occur in the manufacturing, trade, and construction sectors of the local economy. Recent decisions to keep state government functions centralized in Tallahassee ensure a continuation of the stabilizing influence of public sector employment. These and other assets, including the universities, the area's role as a regional retail center, the continually improving transportation network, and the overall attractiveness of the area as a place to live, will continue to foster economic prosperity.

4. ARCHAEOLOGICAL RESOURCES

Archaeological resources are defined as those prehistoric cultural resources antedating a European presence in Leon County. With the establishment of the Spanish missions, the historic period begins around 1550-1600. As of early 1979, 554 archaeological and historical sites have been located in Leon County. Of these, about 450 are archaeological sites and the remaining 100 are historical.

Leon County lies within the Northwest Gulf Coast Archaeological Region, which includes all of Florida west of the Aucilla River as well as adjacent portions of Alabama and Georgia. All portions of this region display the same general sequence of archaeological cultures. Leon County as a whole is rich in archaeologic sites. Known sites are concentrated almost exclusively in the major lake basins above the Cody Escarpment in the red clay hills of the northern part of the county. In southern Leon County, the Munson Slough area appears to contain the relatively greatest potential for archaeological resources although few have been found to date.

5. RECREATIONAL RESOURCES

A wide variety of recreational opportunities are available in Leon County. Apalachicola National Forest is the largest recreational resource in this area covering 103,471 acres. Silver Lake, located within the Forest offers a complete range of outdoor activities.

Leon County contains a number of state-owned parks with an acreage totaling 893. State-owned lakes are substantial both in number and in size with a combined area of 17,969 acres.

On the more local level, a considerable number of parks and recreation facilities are owned by the County and City governments as well as the private sector. All of these are available for public use.

6. TRANSPORTATION

Of the major components of the transportation system (highway, air, rail, and water), only highway and air systems have significant importance to the study area. There are no important navigable waters or significant rail centers in the study area, although there is rail freight service to Leon County.

Four major federal highways intersect the Tallahassee area. These are U.S. 90, U.S. 27, U.S. 319, and I-10. Important State numbered highways serving the area include Florida routes SR 146, SR 20, SR 261, SR 263, and SR 267.

The City of Tallahassee owns and operates the Tallahassee Municipal Airport which is served by several commercial airlines, including Eastern, National, Southern, and Air Florida. Tallahassee Commercial Airport serves the area with general aviation facilities.

The City of Tallahassee is served by Taltran, an intracity busline owned by the City. Greyhound and Trailways Buslines provide intercity bus service to and from Tallahassee.

7. NATURAL RESOURCE USAGE

Various natural resources are found and utilized within the Tallahassee-Leon County study area. The major natural resources are minerals, timber, agriculture, freshwater fish, and wildlife. These resources and their general locations are listed below.

Mineral extraction operations in Leon County are confined to mining quartz sand. Sand mining operations have occurred along the banks of the Ochlockonee River and along the Okefenokee dunes ridge. As of June, 1979, no clay or limestone operations are known to exist in the study area.

The U.S. Forest Service has leased oil and gas rights in the Leon County portion of the Apalachicola National Forest. However, none of the test wells drilled have indicated sufficient volume to justify production activities.

Leon County contains 430,500 acres of land, of which 254,036 acres are used for silviculture. The greatest concentration of forest land is in the southwest within the Apalachicola National Forest. The southeastern portion of the study area is dominated by forests owned by St. Joseph Paper Company. The remainder of the major forested areas are located on old plantation lands owned and managed by private concerns.

Agricultural activity in Leon County is limited. Some citrus groves do operate but on a very limited scale. Horse and dairy farms exist in the study area and account for most of the pasturelands. Individual homes supply some of their own produce with small, backyard garden plots.

Freshwater fish and wildlife supply recreation to hunters and anglers in Leon County but only Lake Jackson is a nationally recognized bass resource and attracts sportsmen from Florida and nearby states.

8. SOLID WASTE DISPOSAL

One sanitary landfill is found in the study area, located on U.S. 27 South. It is owned and operated by Leon County. The existing site comprises 620 acres with only 82 acres permitted at this time and has a life of 30 years. The sanitary landfill operates by the trench method and uses the cell concept for compacting the the refuse. The landfill currently disposes of about 400 tons of waste daily.

To protect the groundwater from leachate contamination, the landfill is provided with a runoff pond that collects and detains the leachate from the landfill. A system of ten monitoring points has been established to check on the water quality at the site. Water quality monitoring at these points includes samples taken from eight ground water test wells and two surface water locations -- the runoff pond and Lake Lafayette. Monitoring results show no significant changes in background levels, which indicates no leachate contamination.

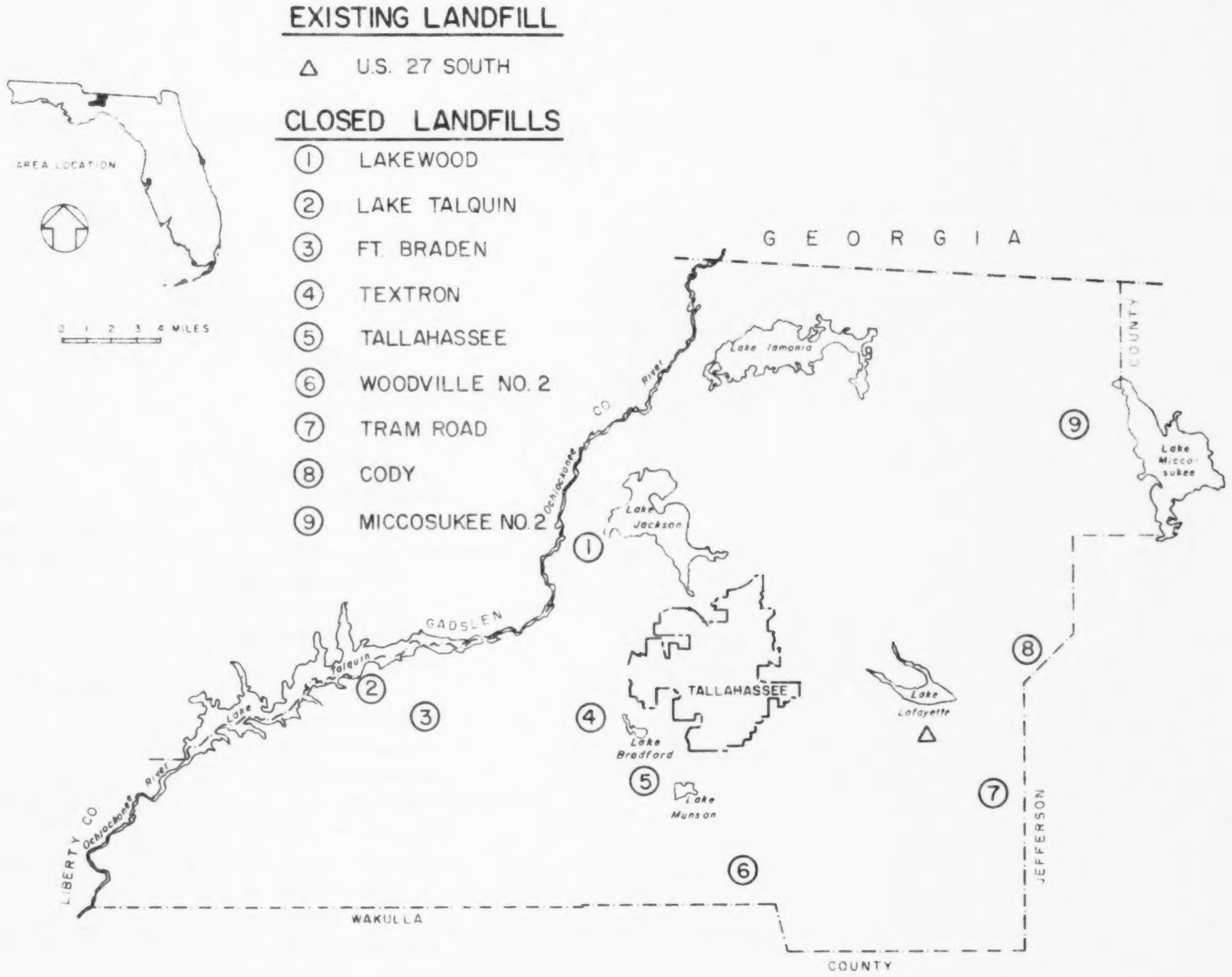
With the opening of the Leon County Sanitary Landfill in August, 1977, several smaller landfills operated by Leon County were closed. These landfills were located in isolated areas with good drainage. The locations of these closed landfills and the Leon County Sanitary Landfill are shown on Figure IV.8.

9. WASTEWATER PROGRAMS

The major issue of this Environmental Impact Statement is the proper treatment and disposal of wastewater in the Tallahassee-Leon County area. There are five municipal wastewater treatment plants in the study area, all of which are owned by the City of Tallahassee. Besides these public facilities, there are eighteen privately-owned wastewater treatment plants scattered through the study area. These treatment facilities are listed and located on Figure IV.9. In addition, subsurface on-lot treatment and disposal is used extensively by individuals and commercial establishments in all areas not served by municipal water facilities.

Collection System

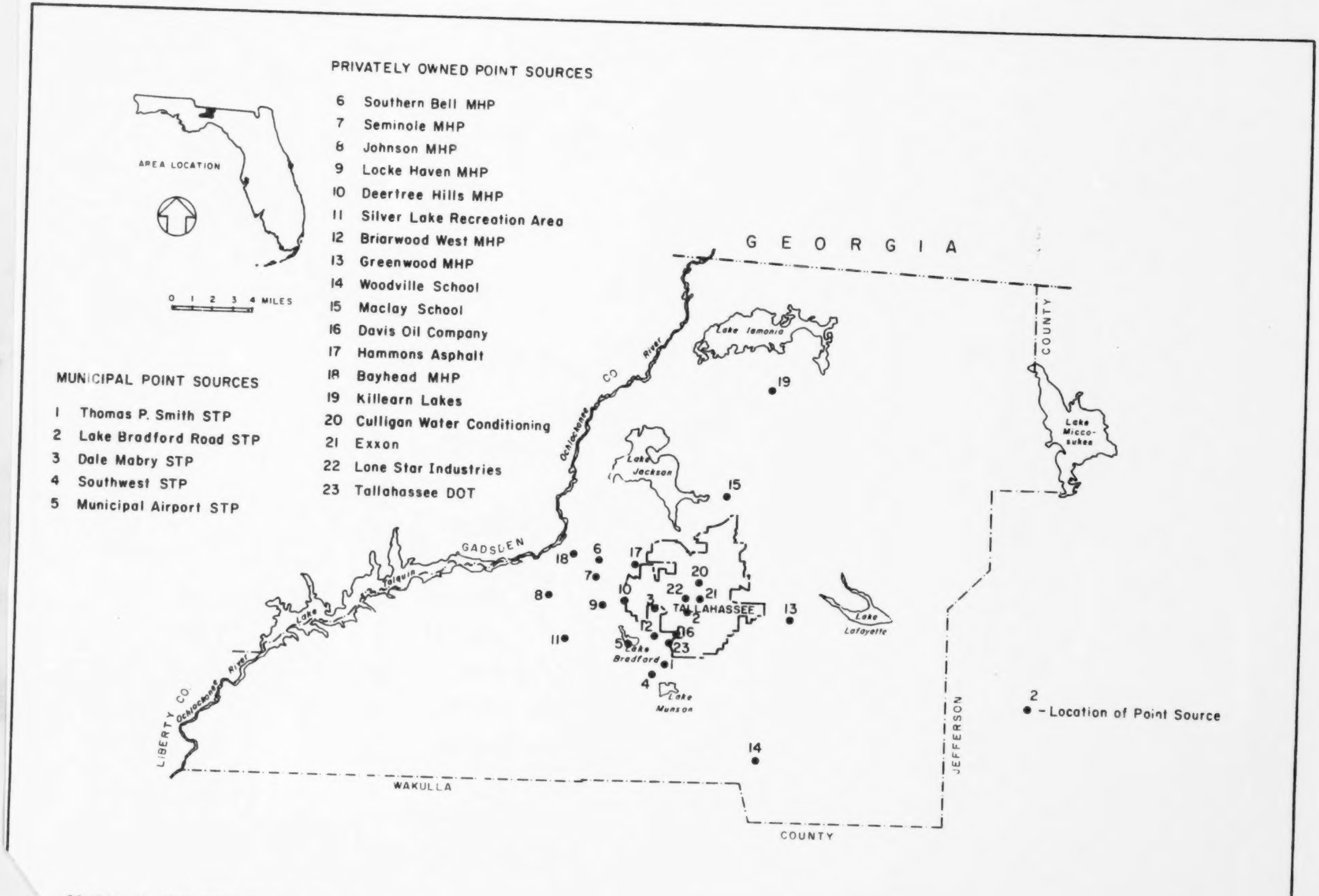
The City of Tallahassee wastewater collection and treatment system serves approximately a 60-square mile area with a population approaching 90,000. Wastewater is conveyed by approximately 430 miles of sewer lines, both gravity and force mains, to the various treatment plants. These sewer lines range in size from 4-inch force main to 42-inch gravity


EXISTING LANDFILL
△ U.S. 27 SOUTH
CLOSED LANDFILLS
① LAKEWOOD
② LAKE TALQUIN
③ FT. BRADEN
④ TEXTRON
⑤ TALLAHASSEE
⑥ WOODVILLE NO. 2
⑦ TRAM ROAD
⑧ CODY
⑨ MICCOSUKEE NO. 2
AREA LOCATION
0 1 2 3 4 MILES
GEORGIA
COUNTY
JEFFERSON
COUNTY
WAKULLA
LIBERTY CO
Ochlockonee River
GADSDEN
Ochlockonee CO River
Lake Talquin
Lake Iamonia
Lake Miccosukee
Lake Jackson
TALLAHASSEE
Lake Bradford
Lake Munson
Lake Lafayette

SOURCE OF BASE MAP: State of Florida,
Department of Transportation

LEON COUNTY
SANITARY LANDFILLS

FIGURE IV.8


AREA LOCATION
0 1 2 3 4 MILES
G E O R G I A
COUNTY
JEFFERSON
COUNTY
WAKULLA
GADSDEN
LIBERTY CO.
Ochlockonee River
Ochlockonee CO River
Lake Talquin
Lake Iamonia
Lake Jackson
Lake Miccosukee
Lake Lafayette
Lake Bradford
Lake Munson
TALLAHASSEE
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• - Location of Point Source

MUNICIPAL POINT SOURCES

1	Thomas P. Smith STP
2	Lake Bradford Road STP
3	Dale Mabry STP
4	Southwest STP
5	Municipal Airport STP

PRIVATELY OWNED POINT SOURCES

6	Southern Bell MHP
7	Seminole MHP
8	Johnson MHP
9	Locke Haven MHP
10	Deertree Hills MHP
11	Silver Lake Recreation Area
12	Briarwood West MHP
13	Greenwood MHP
14	Woodville School
15	Maclay School
16	Davis Oil Company
17	Hammons Asphalt
18	Bayhead MHP
19	Killearn Lakes
20	Culligan Water Conditioning
21	Exxon
22	Lone Star Industries
23	Tallahassee DOT

SOURCE OF BASE MAP : State of Florida,
Department of Transportation

LEON COUNTY POINT SOURCES

sewers and include about 7,000 manholes to aid maintenance of the sewer lines. There are 89 pumping stations located within the collection system.

In April, 1980 flow monitoring program was undertaken, by the EIS consultant, to determine the excess or lack of excess capacity in the major collection system. The results of this study were published as an Appendix to the Draft Alternatives Evaluation Task Report, Volume II (EPA, 1981). For the most part, the existing wastewater collection system has sufficient capacity to serve its immediate and future wastewater needs. However, the lines serving the areas just south of Meginnis Arm and neighborhoods north of Centerville Road and east of Meridian Road are operating near or over capacity. Construction programs are currently underway to relieve these constraints to expansion.

Infiltration and inflow into a wastewater wastewater collection system can produce hydraulically overloaded sewer lines and treatment plants. The extent of infiltration and inflow (I/I) within the Tallahassee wastewater collection system was evaluated in detail in the 201 planning effort. The following general observations concerning the Tallahassee collection system were made in the 201 Plan:

- The overall condition of the collection system is good.
- The City's TV inspection and maintenance program is good within its capabilities, but lacks the necessary equipment for inspection in the more I/I-prone low-lying drainage areas.
- Several areas of this collection system are presently overloaded and need upgrading.
- The City has good control of new sewer design but provides very little control over construction, which often allows potential I/I sources to remain uncorrected.
- The City's sanitary sewer collection system maps, particularly of the older sections, are neither accurate nor comprehensive enough for sufficient management of sewer system requirements.
- Root intrusion is a major problem, particularly in older sections of the system where joints have deteriorated.

I/I is not considered excessive in the study area and, therefore, it is more economical for the City of Tallahassee to treat the I/I than to rehabilitate the sewer system. Table IV.14 lists the estimated I/I per storm event.

Tallahassee Municipal Treatment Plant

Thomas P. Smith Treatment Plant - The Thomas P. Smith plant is an activated sludge facility with a design capacity of 7.5 mgd. This plant has the flexibility to operate either as step aeration, contact

TABLE IV.14
TOTAL I/I PER STORM EVENT

Rainfall Inches/ 24 hrs.	*Estimated Inflow MGD	**Estimated Infiltration MG/3 Days	Dry Weather Infiltration	Total I/I MG/Event
1"	.74	1.26	.039	2.04
2"	1.48	2.46	.039	3.98
3"	2.22	3.69	.039	5.95
4"	2.96	4.92	.039	7.92
5"	3.70	6.15	.039	9.89
6"	4.44	7.38	.039	11.86
7"	5.18	8.61	.039	13.83
8"	5.92	9.84	.039	15.80
9"	6.66	11.07	.039	17.77

*Inflow based on day of rainfall event, infiltration based on 3 days following rainfall event.

**Three day total.

Source: Tallahassee-Leon County Florida 201 Facilities Plan
William M. Bishop Consulting Engineers, Inc.

stabilization, or conventional activated sludge. Major wastewater treatment processes include mechanically cleaned bar screen, grit chamber, aeration, clarification, and chlorination.

The treated effluent enters a holding pond with a detention time of 24 hours. Effluent is either discharged to Munson Slough, where it eventually enters Lake Munson or is sprayed onto 120 acres of land surrounding the treatment facility.

Sludge treatment and disposal at the Thomas P. Smith plant is by aerobic digestion, centrifugation, and sand drying beds. Ultimate sludge disposal is by spreading on City-owned lands adjacent to the airport.

Because of its size and location, the Thomas P. Smith plant receives wastewater from much of the study area and presently treats an average flow of 6.9 mgd. This plant operates in parallel with the Southwest plant located on the same site. The Southwest plant also utilized the same holding pond and disposal methods as the Thomas P. Smith plant.

Because both the Thomas P. Smith and the Southwest plants share the same discharges, they operate under the same permit. The performance date listed in Table IV.15 represents the treatment efficiencies of both plants. Plant performance is considered good, with high quality effluent being produced. Future plans for the Thomas P. Smith plant include expansion from its present design capacity of 7.5 mgd to 15 mgd.

Southwest Treatment Plant - The Southwest plant is a high-rate trickling filter facility located at the same site as the Thomas P. Smith plant. The plant has a design capacity of 2.5 mgd. Major wastewater treatment processes include bar screen, grit chamber, primary sedimentation, trickling filtration, final clarification, and chlorination. As with the Thomas P. Smith plant, the treated effluent enters a holding pond, where it is then discharged to Munson Slough or is spray irrigated on adjacent fields at the site.

Although the plant is well maintained and operated, it does not meet the performance standards set by its permitted removal of 90 percent BOD and suspended solids. Because of this, the plant was upgraded in 1980 with Rotating Biological Contractors (RBC) constructed between the trickling filter and the final clarifier. In addition, the trickling filter rock media was replaced with plastic media and tertiary filters have been added to the process train.

Sludge treatment of the Southwest plant consists of anaerobic digesters. Sludge is disposed of either by spreading on City-owned lands or by distribution to residents as a fertilizer or soil conditioner.

Because the effluents from both the Thomas P. Smith and the Southwest plants are combined in a detention pond before discharge, the performance characteristics of the effluents are the same. The combined performance data of the T. P. Smith and Southwest plant can be found on Table IV.15.

Lake Bradford Treatment Plant - The Lake Bradford plant, a 4.5 mgd activated sludge facility, treats wastewater generated from the central core of Tallahassee including institutional flow from both the Florida State

TABLE IV.15
T. P. SMITH/SOUTHWEST PLANT PERFORMANCE DATA

	Flow (mgd)	% Removal BOD_5	% Removal Susp. Solids	Lbs/Day BOD_5	Lbs/Day Susp. Solids
Permit Limits*	10.00	90	90	1251	1251
November, 1977	6.29	96	93	367	734
December, 1977	6.08	96	93	304	608
January, 1978	6.70	95	92	503	670
February, 1978	6.91	94	93	576	691
March, 1978	7.88	91	92	1117	986
April, 1978	6.97	94	93	757	930
May, 1978	7.12	92	93	772	712
June, 1978	6.90	95	97	518	403
July, 1978	7.57	96	94	379	505
August, 1978	6.79	96	94	227	396
September, 1978	6.80	98	97	227	340
October, 1978	5.78	96	96	289	337
Average	6.82	95	94	503	609

*Temporary Operating Permit (D037-2109) expires October 1, 1980.

Source: City of Tallahassee Water Quality Laboratory,
Monthly Operating Reports

University and Florida A & M as well as from the state government complex. Major processes at the plant include a bar screen, primary clarification, aeration, secondary clarification, and chlorination. Sludge is treated with two anaerobic digesters and then disposed of on City-owned lands surrounding the airport. Treated effluent from the plant is discharged into Munson Slough and flows 4.5 miles to Lake Munson. Any flow in excess of 4.5 mgd is diverted to the Thomas P. Smith/Southwest treatment facility.

Historical plant performance data for the Lake Bradford plant is presented in Table IV.16. The data indicate that the plant is well operated and maintained, and produces a high quality effluent.

Based on a cost-effective analysis performed in the 201 Planning effort the Lake Bradford plant is to be closed when the expansion of the Thomas P. Smith plant is completed. However, due to questions raised by area citizens and the performance of the Lake Bradford plant, abandonment of this facility has become an issue in this EIS.

Dale Mabry Treatment Plant - The 0.9 mgd Dale Mabry plant is a trickling filter-activated sludge facility built in 1940. The City of Tallahassee will abandon the Dale Mabry plant when the expansion of the Thomas P. Smith plant is completed.

Municipal Airport Treatment Plant - The Municipal Airport facility is a small package plant with a design capacity of 60,000 gpd serving the needs of the Tallahassee Municipal Airport. This plant will be abandoned with the completion of the expansion program at the Thomas P. Smith plant.

Spray Irrigation

Spray irrigation in Tallahassee has been used as a wastewater disposal method since it began as an experimental project in 1966. The use of spray irrigation is, in part, a response to the problem of treated effluent flowing into Lake Munson. Severe algal blooms and fishkills are alleged to have been caused by treatment plant effluent being discharged to the lake.

Site descriptions - There are presently two spray irrigation disposal sites in the Tallahassee-Leon County study area. The first site is located on land which was part of the Apalachicola National Forest. This site has recently been expanded to 1.0 mgd capacity.

Geologically, the site is part of Lake Munson Hills, a 40-square mile area at the western edge of the Woodville Karst Plain. The 120-acre site is 50 to 70 feet above mean sea level, with the normal static water level 40 feet below ground surface. The soil is mostly Lakeland fine sand with a typical infiltration capacity of 3 to 4 inches per hour. The low natural fertility and poor moisture-holding capacity is reflected by the natural vegetation of scrub oak and similar plants.

TABLE IV.16
LAKE BRADFORD PLANT
PERFORMANCE DATA

	Flow (mgd)	% BOD_5 Removed	% Susp. Solids Removed
Permit Limits*	4.5	90	90
November, 1977	4.12	98	95
December, 1977	3.99	98	94
January, 1978	4.12	97	91
February, 1978	3.98	96	93
March, 1978	4.20	96	94
April, 1978	4.17	98	97
May, 1978	4.11	97	95
June, 1978	3.78	97	96
July, 1978	3.62	98	98
August, 1978	3.69	98	97
September, 1978	3.68	98	96
October, 1978	4.02	99	96
Average	3.96	97	95

*Temporary Operating Permit (DO37-2378) in effect until resolution of revised temporary permit by State of Florida DER

Source: City of Tallahassee Water Quality Laboratory
Monthly Operating Records

The second spray irrigation disposal site was completed in 1980 as part of the approved Phase I facilities of the 201 Plan. This site is located southeast of the City of Tallahassee along Old Tram Road. The 2,000-acre site is intended to dispose of 17.5 mgd.

Chemical, Physical, and Biological Monitoring - Selected chemical and biological parameters are monitored throughout the system. The wastewater is tested for pH, chlorides, orthophosphate, BOD, COD, TOC, nitrate-nitrogen, and coliform bacteria. To determine any cause and effect relationships, field samples undergo the same analytical test as the wastewater effluent samples.

Private Wastewater Collection and Treatment Systems

There are 18 private wastewater systems located in the study area. These facilities, and basic information on each, are listed in Table IV.17. Most of these treatment plants discharge to surface water while the remainder employ discharge to the atmosphere or groundwater via evaporation-percolation ponds and spray irrigation systems. A number of these private wastewater systems are to be connected with the municipally-owned sewer systems as expansion takes place.

On-Site Treatment And Disposal Systems

In areas not served by municipal sewer facilities, individual homes and businesses rely on some method of subsurface on-site treatment and disposal. Major areas utilizing on-site systems include the more recently developing areas in northeastern Leon County. It should be noted that some areas within the sewered portion of Tallahassee rely on on-site disposal systems and may remain that way because the City finds it infeasible to provide service to these areas.

Most soils in Leon County are classified as part of the Dothan-Orangeburg Series. These soils are generally considered suitable for on-site disposal. Figure IV.10 shows the areas where soils are considered suitable for on-site disposal.

Septic tank failures have been documented by the Leon County Health Department. These failures are mostly scattered in rural areas and the area surrounding Meginnis Arm of Lake Jackson. An EIS study has identified and investigated the causes behind the malfunctioning septic systems in the area designated as the J-Series which lies just east of Meginnis Arm of Lake Jackson along Lake Shore Drive. Problems of malfunctioning affect new and old on-site disposal systems in medium and high-density housing locations.

It has been concluded that problems in the J-Series area are due to:

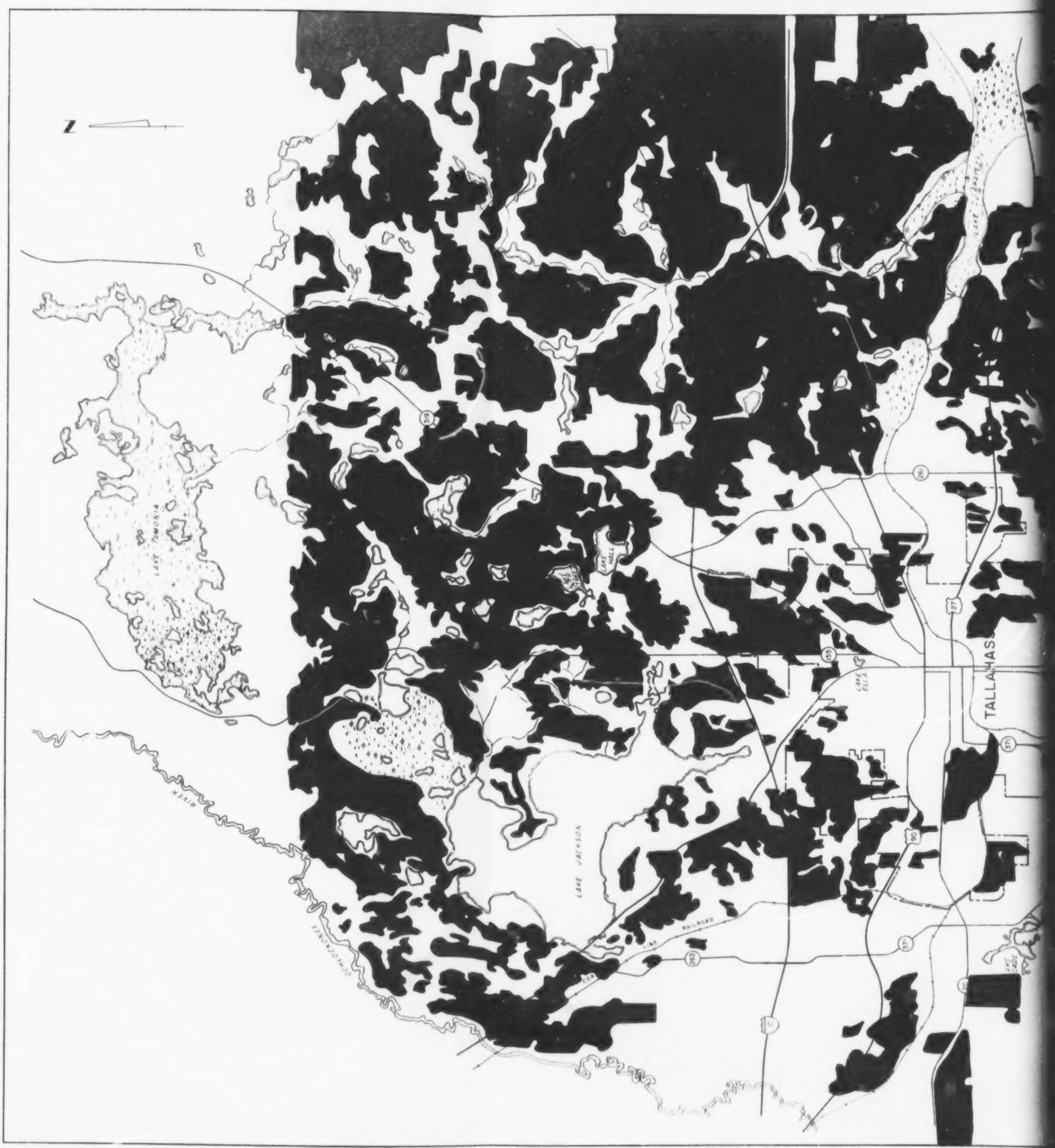
- Small patches of unsuitable soils

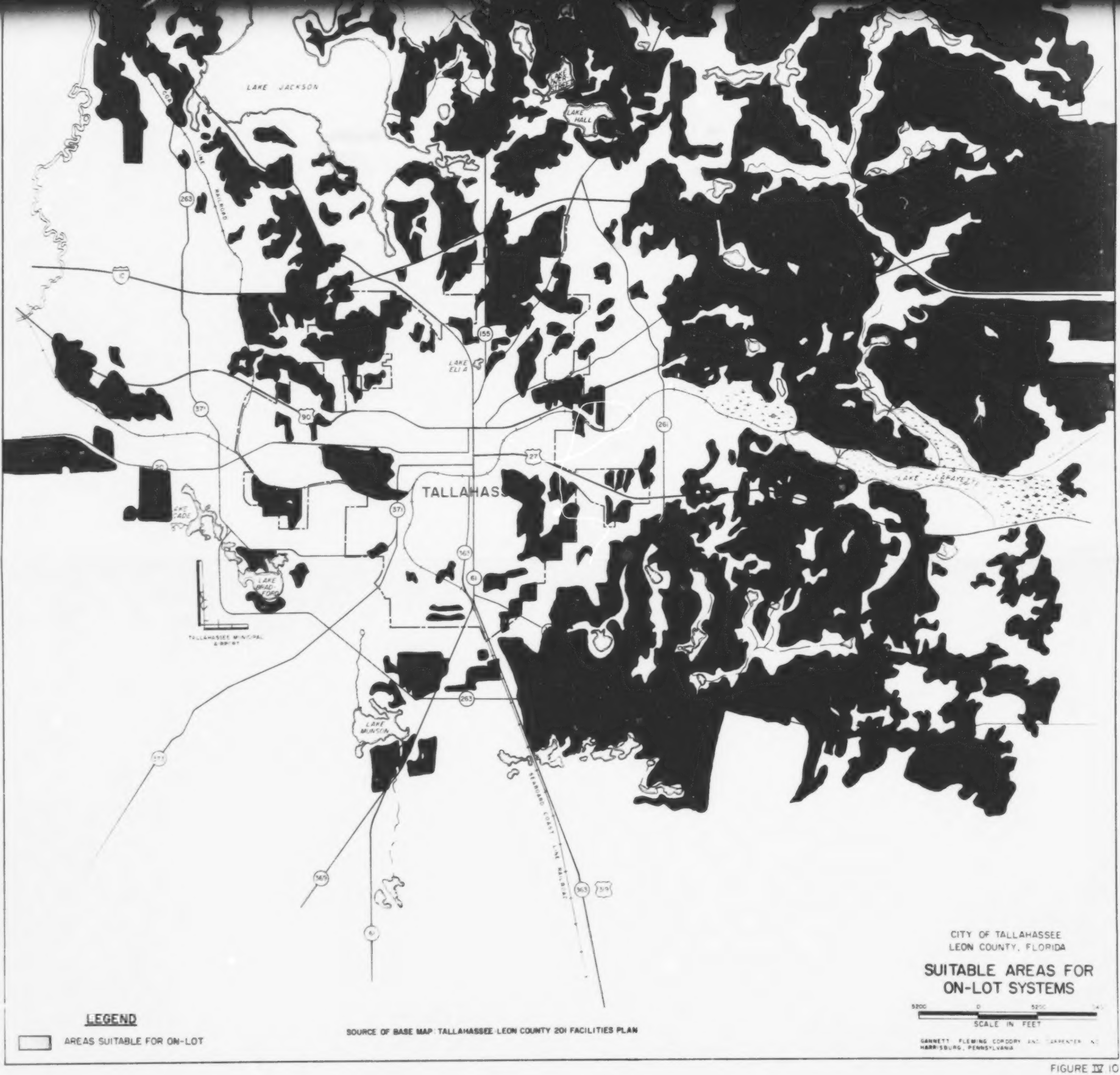
Reproduced from best available copy.

TABLE IV.17
PRIVATE WASTEWATER TREATMENT PLANTS

Facility	Location	Treatment	Design Capacity (gpd)	Discharge Point
Southern Bell MHP	U.S. 90W-W. of Capital Circle	Extended Aeration	15,000	West Munson Slough
Seminole MHP	U.S. 90W-W. of Capital Circle	Extended Aeration	23,000	West Munson Slough
Johnson MHP	Intersection of SR20 & SR260	Extended Aeration	15,000	Evaporation-Percolation Pond
Locke Haven MHP	SR20-W. of Capital Circle	Extended Aeration	20,000	Aenon Creek
Deertree Hills MHP	SR20-W. of Capital Circle	Extended	9,000	Aenon Creek
Silver Lake Rec. Area	SR260-S. of SR20	Extended Aeration	-	Spray Irrigation Field
Briarwood West MHP	Jewell Dr.-E. of SR371A	Contact Stabilization	30,000	Black Swamp
Greenwood MHP	Old St. Augustine Rd.	Extended Aeration	15,000	Creek to Lake Lafayette
Woodville School	Junct. of SR319 & Natural Bridge Rd.	Extended Aeration	5,000	Drainfield
Maclay School	N. Meridan Rd.-N. of US90	Extended Aeration	5,000	Evaporation-Percolation Pond
Davis Oil Company	Orange Avenue	-	10,000	Munson Slough
Hammons Asphalt	Blountstown Highway	Extended Aeration	35,000	West Munson Slough
Bayhead MHP	W. Tennessee St.	Contact Stabilization	50,000	Evaporation-Percolation Pond
Killearn Lakes	N. of Lake Jackson	-	40,000	Man-Made Lake
Culligan Water	W. Brevard St.	-	-	West Munson Slough
Exxon	W. Gaines St.	-	-	West Munson Slough
Lone Star Ind.	Pensacola St.	-	-	West Munson Slough
Tallahassee DOT	Springhill Road	-	-	Munson Slough

Source: Tallahassee-Leon County 208 Plan, Tallahassee-Leon County Planning Department
Tallahassee-Leon County 201 Plan, William M. Bishop Consulting Engineers, Inc.


N
LAKE IAMONIA
OCHLOCKONEE RIVER
LAKE JACKSON
LAKE HALL
LAKE ELLA
TALLAHAS
319
27
155
371
90
263
LINE RAILROAD


LAKE JACKSON
LAKE HALL
LAKE ELLA
TALLAHASS
LAKE LAFAYETTE
LAKE BRADFORD
LAKE CADE
LAKE MUNSON
TALLAHASSEE MUNICIPAL AIRPORT
SCL LINE RAILROAD
SEABOARD COAST LINE RAILROAD
10
263
155
261
27
90
20
371
363
61
319
373
5200
0
5200
SCALE IN FEET

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

SUITABLE AREAS FOR
ON-LOT SYSTEMS

GANNETT FLEMING CORDDRY AND CARPENTER INC
HARRISBURG, PENNSYLVANIA

LEGEND

☐ AREAS SUITABLE FOR ON-LOT

SOURCE OF BASE MAP: TALLAHASSEE-LEON COUNTY 201 FACILITIES PLAN

FIGURE IV 10

- Lack of maintenance such as periodic resting of an absorption field and periodic removal of solids
- Flows of wastewater which exceed system capacity because of undersizing or unexpected flow increases
- Uneven distribution of effluent onto an absorption field
- Excessive compaction of soil within the absorbtion field during installation.

10. EXISTING DEVELOPMENT CONTROLS

Land development controls are an important aspect of water quality management planning. Land use regulations can be used to direct development away from sensitive environmental areas, including water quality-sensitive areas. Land use controls can also serve to mitigate any short or long-term negative impacts that may result from the provision of wastewater treatment and disposal facilities.

The list that follows is a summary of federal, state and local laws relating to land use control and environmental preservation. It focuses upon local ordinances and regulations since they are potentially the most effective means for dealing with many of the development and environmental issues raised during the 201 Study public participation process. A large part of the following, including the comments on the effectiveness of each control, was taken from information developed by the Tallahassee-Leon County Planning Department (TLCPD). The data were developed as Part IV,, "Implementation Techniques," of the draft Conservation/Open Space Element.

Local Ordinances and Regulations

In addition to the traditional zoning ordinance and subdivision regulations, the City of Tallahassee and Leon County have adopted a series of special purpose ordinances which may be applied in the preservation of sensitive lands, irreplaceable resources, or necessary open space. Each ordinance is summarized below.

Planned Unit Development Zoning (PUD): This ordinance provides for the preservation of "critical" lands in Leon County by requiring:

1. A minimum acreage size
2. Open space
3. Preparation of general site inventory information
4. Preparation of conceptual and detailed site plans

PUD allows higher density development of "clusters" on more suitable portions of a site. This is not a comprehensive approach to the protection of "critical" or sensitive areas.

Limited Use Zoning (LUZ): LUZ allows for the control of land use intensity. It, however, is not oriented to monitor and preserve important natural areas.

Historic and Cultural Zoning (HC): The HC District establishes designated zones in which historic resources are protected against destruction, encroachment, or inappropriate alteration while encouraging reuse of the structures. The implied usage is preservation of structures. The HC presently does include archaeologic resources or the conservation of sensitive ecosystems as cultural resources.

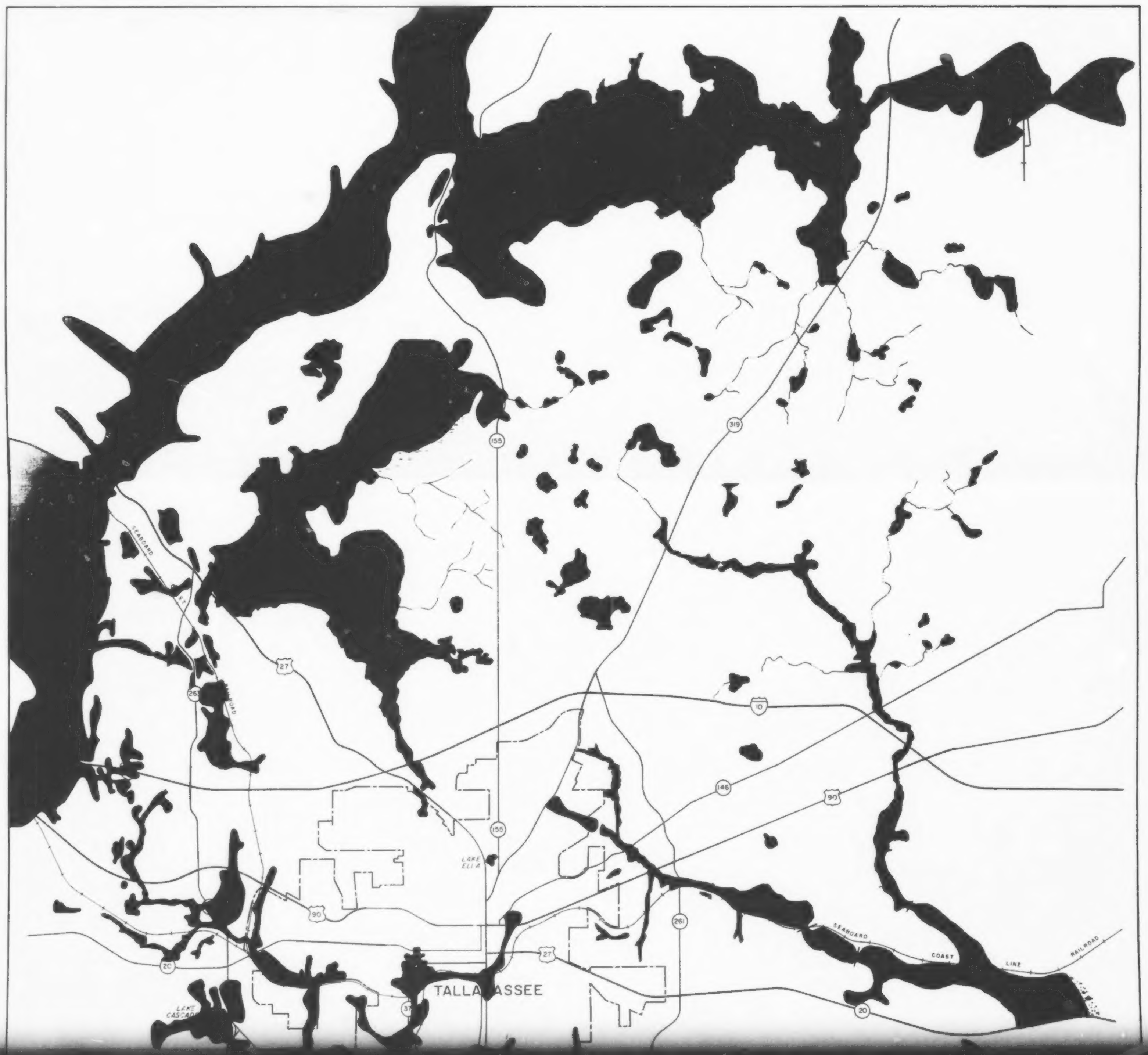
Agricultural Zoning (A): The A-1 and A-2 Agricultural Districts are intended for the preservation of agricultural lands and certain other non-intense activities compatible with agricultural usage. However, the existing agricultural zones do not adequately protect farmland.

Airport Noise/Environmental Noise Regulations (Proposed).: This proposed regulation is limited to a requirement that any prospective buyer or lessee within the airport noise zone (100 CNR, 85dBA contours) be issued a warning informing him of the status of the property with regard to location beneath the airport approach path and the objectionable noises that might be expected. According to TLCPD, this ordinance does not address the subject of compatible usages within this zone. Although not yet adopted, outer contours of noise zone as delineated by the regulation have been incorporated into a land use plan which was adopted as part of the Comprehensive Plan December 23, 1980 and went into effect January 1, 1981.

Downzoning: Downzoning involves a reduction of the current permitted intensity of land use for both type and density of development. The downzoning action could bring about land use patterns more properly in keeping with conservation recommendations. Screening and Buffering Regulations. These actions are used to lessen the impact of objectionable or incompatible uses of land. Buffering and screening deals with vegetation type and opacity on an overall site.

Subdivision Regulations: Presently there are no adopted subdivision regulations in the County.

Tallahassee Flood Plain Management Ordinance: This ordinance was prepared to meet requirements of the Federal Emergency Management Agency Flood Insurance Program. Major flood prone areas developed by the USGS are shown on Figure IV.11. The ordinance prohibits any type of new construction, fill, or substantial improvement (repair exceeding 50% of assessed value) to existing structures in floodways delineated by the Flood Insurance Study unless offset by channel improvements. It also requires construction to occur at a minimum of one square foot above the level of the 100-year flood. However, these restrictions don't effectively prohibit reduction of flood storage area by development.



SEABOARD COAST LINE RAILROAD
TALLAHASSEE
LAKE ELLA
LAKE CASCADE
319
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27
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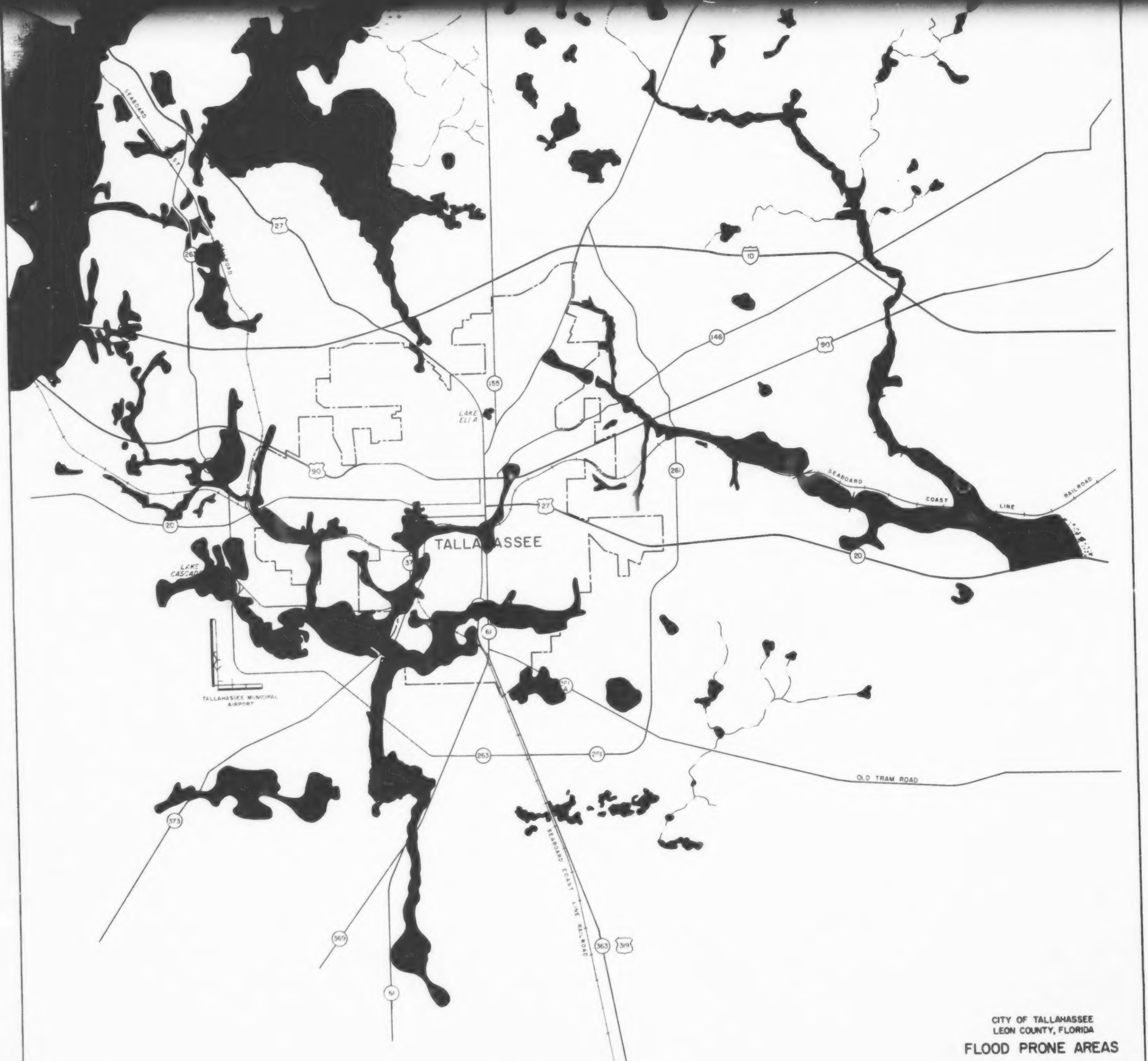
146
90
261
263
20
37



SEABOARD COAST LINE RAILROAD
TALLAHASSEE
LAKE ELLA
LAKE CASCADE
TALLAHASSEE MUNICIPAL AIRPORT
OLD TRAM ROAD
27
10
146
90
261
263
20
37
61
265
373
363
319

LEGEND

● MAJOR FLOOD PRONE AREAS

SOURCE OF BASE MAP: TALLAHASSEE-LEON COUNTY 201 FACILITIES PLAN

CITY OF TALLAHASSEE
LEON COUNTY, FLORIDA

FLOOD PRONE AREAS

5200 0 5200 10400
SCALE IN FEET

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PENNSYLVANIA

FIGURE IV.11

IV-66

The Garbage, Trash and Weeds Ordinance.: This ordinance requires containerization of refuse previously collected by separate crews in the City. This ordinance prohibits pick-up of curb or street-piled leaves and debris which frequently find their way into the storm sewer system. One intent of this ordinance is to reduce the organic loading to our lakes by reducing the debris introduced into the storm drainage system.

Tree Ordinance: It protects specimen trees over certain sizes from unnecessary destruction during site preparation and construction in specific areas. The protection applies to trees within setbacks in zoning areas not considered residential or agricultural.

Canopy Roads Ordinance: This ordinance establishes zones of protection along certain highways classified as canopy roads. Within these zones, height and setback requirements restrict destruction of the tree canopy along scenic roadways.

Stormwater Management Ordinance (Proposed): Its intent is to reduce property damage and hazards of personal injury and loss of life due to flooding, and to maintain the quality of both surface and groundwater resources. This ordinance establishes stormwater management control areas and restricts activities within those areas which would be incompatible with the function of permanent wetlands and areas subject to periodic flooding. It establishes greenbelts as buffers to these areas. This ordinance is presently on hold. However, the County Administrator's Office has assigned a study group to work on it.

Runoff and Sedimentation Ordinance (ERS): The intent of the ERS Ordinance is to eliminate the adverse downstream impacts resulting from on-site conditions which produce erosion, sedimentation, and runoff. Persons changing the physical characteristics of the land by grading, clearing, etc., are required to apply for a clearing permit from the Leon County Division of Environmental Services. This permit requires that a site plan be submitted along with an application fee. Criteria of the ordinance were evaluated and it was found that parameters related to sediment size set by the ordinance were inadequate. Also the enforcement of such an ordinance is extremely difficult.

State Acts

- 1970 Water Pollution Control and Sewage Treatment Plan Grant Act--Authorizes state monies for treatment facilities.
- 1971 Environmental Protection Act--Establishes a legal basis for enforcement of environmental legislation.
- 1972 Water Resources Act--Enables management of waters and related resources.
- 1972 Land and Water Management Act--Establishes procedures for evaluating developments of regional impact and assessment and designation of areas of critical state concern.

- 1974 Environmental Reorganization Act--Creates the Department of Environmental Regulation from various other agencies and establishes districts for administration purposes.
- 1975 Local Government Comprehensive Planning Act--Requires preparation and adoption of comprehensive plans by municipalities and counties by July 1, 1979. The Tallahassee-Leon County Comprehensive Plan was jointly adopted by City and County December 23, 1980 to be effective January 1, 1981.

Federal Acts

- 1966 and 1973 Endangered Species Preservation Acts: Protects endangered species and the buying and selling of endangered flora.
- 1969 National Environmental Policy Act: Requires consideration of the environmental impact of all federally-funded projects.
- 1970 Council on Environmental Quality: Establishes an advisory body to the President.
- 1970 Environmental Protection Agency: Consolidates a fragmented program of environmental regulation into a single agency.
- 1970 Clean Air Act: Establishes ambient air quality standards for Federal Government implementation.
- 1972 Water Pollution Control Act: Requires a permit program for liquid waste dischargers, sets water quality standards and goals for the nation.
- 1972 Noise Control Act: Establishes noise emission standards.

Summary

An evaluation matrix of the effectiveness of local laws for protecting environmentally sensitive areas is shown in Table IV.18. According to TLCPD, Leon County and the City of Tallahassee at present administer many environmentally oriented regulatory measures. However, most ordinances now in effect are for the purpose of regulating development. Few ordinances take a comprehensive approach toward resources and their use. The DRI process is an effective review mechanism which has possible applications at a smaller scale by local governments.

The Developments of Regional Impacts (DRI) process is an effective review mechanism which has possible applications at a smaller scale by local governments.

TABLE IV.18

THE EFFECTIVENESS OF EXISTING ORDINANCES AND REGULATIONS IN ACCOMPLISHING CONSERVATION AND OPEN SPACE OBJECTIVES

Conservation/ Open Space Objectives Existing and Proposed Conservation and Open Space Controls	Improves or protects air quality and/or noise levels	Improves or protects ground and surface water quality	Encourages proper soil management	Encourages preservation of wildlife	Protects or conserves sensitive ecosystems	Protects or conserves scenic areas	Protects or conserves historic, cultural, or archaeologic resources	Discourages use of environmental hazard areas	Encourages the provision of open space
City and County									
Planned Unit Development	○	△	△	△	△	△	△	△	□
Limited Use Zone	○	△	△	△	△	△	△	△	△
Historic/Cultural District	○	△	△	△	△	□	□	○	△
Mobile Home Park District	○	△	△	△	△	△	○	△	□
Agricultural District	○	△	△	△	△	△	○	○	△
Airport Noise District	△	○	○	○	○	○	○	△	○
Down-Zoning	□	□	□	□	□	□	△	□	△
Screening and Buffering	△	○	○	△	○	□	△	○	△
Subdivision Regulations	○	△	△	△	○	○	○	△	△
Flood Plain Ordinance	○	□	△	□	□	○	○	□	□
Garbage, Trash, and Weeds Ordinance	NA	□	○	○	○	○	○	○	○
Stormwater Management Ordinance	NA	□	□	□	□	○	○	□	□
Erosion, Runoff, and Sedimentation Ordinance	NA	□	□	○	○	○	○	○	○
Tree Ordinance	△	○	○	△	○	△	△	○	○
Canopy Roads Ordinance	△	○	○	△	○	□	□	○	□

*Proposed Controls

Effective □ --Those ordinances displaying a large number of squares are the most flexible and effective.

Potentially Effective △ --Those ordinances displaying a large number of triangles are potentially effective if modified.

Ineffective ○ --Those ordinances displaying a large number of circles are either ineffective or only effective when applied to specific environmental problems.

Not Applicable NA --Those ordinances not designed to address this issue

Source: Tallahassee-Leon County Planning Department

At present, local ordinances controlling environmental noise, sign clutter, air quality, and protection of scenic and wildlife resources are lacking.

PART D. ENVIRONMENTAL IMPACTS OF ALTERNATIVES

This section of the EIS analyzes the environmental impacts described in Part D with regard to their being direct or indirect, positive or negative, short term or long term, and their degree of impact (major, significant, minor, and insignificant) for the study area as a whole. Tables IV.19 and IV.20 display alternatives side by side for ease of comparison. A more detailed comparison of impacts can be found in the Alternatives Evaluation task report (EIS, 1980).

TABLE IV.19
IMPACTS ON THE NATURAL ENVIRONMENT

Environmental Parameter	Description Of Impact	Alt.1-T.P.Smith & Northeast				Alt.2-T.P.Smith Regional				Alt.3-T.P.Smith & Southeast				Alt.4-No Federal Action			
		Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins.[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]
Odor	Odors from improperly stabilized sludge stored or incorporated into the soil	D	-	S	Min	D	-	S	Min	D	-	S	Min				
	Odors related to septic tank malfunction													D	-	S	Min
Noise	Construction related: Laying of collection lines, clearing sprayfield and sludge disposal sites, plant construction	D	-	S	Min	D	-	S	Min	D	-	S	Min				
	Operation of farm machinery and trucks hauling/spreading sludge	D	-	L	Min	D	-	L	Min	D	-	L	Min				
Air Quality	None of note																
Topography	Some earth moving to construct rapid infiltration percolation ponds	D	0	S	Min												
Geology	None of note																
Soils	Soils clogging at rapid infiltration percolation ponds	D	-	S	Sig												
	Improve soils by incorporation of sludge and crop residues	D	+	L	Min	D	+	L	Min	D	+	L	Min				
Surface Water Quality	Sedimentation from stream crossings during laying of collection system	D	-	S	Maj	D	-	S	Maj	D	-	S	Maj	D	-	S	Min
	Leakage from lines crossing streams and wetlands	D	-	L	Min	D	-	L	Min	D	-	L	Min	D	-	L	Min
	Overland runoff or lateral seepage to nearby surface water bodies from sprayfields and sludge disposal sites.	D	-	L	Sig	D	-	L	Sig	D	-	L	Sig				

NOTE: Absence of notation indicates that impact is not caused by that alternative.

1. Positive +
   Negative -
   Neutral o

2. All impacts have been evaluated on the basis of their degree of significance for the study area as a whole.

TABLE IV.19
IMPACTS ON THE NATURAL ENVIRONMENT (Cont'd.)

Environmental Parameter	Description Of Impact	Alt.1-T.P.Smith & Northeast				Alt.2-T.P.Smith Regional				Alt.3-T.P.Smith & Southeast				Alt.4-No Federal Action			
		Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins.[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins.[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins.[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]
Surface Water Quality (Continued)	Increased urban runoff from increases in impervious surfaces as a result of development	I	-	L	Maj	I	-	L	Maj	I	-	L	Maj	I	-	L	Sig
	On-site system malfunction causing pollution of surface water bodies													D	-	S	Min
Surface Water Quantity	Increases in impervious surface can lead to flooding; site retention of storm water inadequate	I	-	L	Sig	I	-	L	Sig	I	-	L	Sig	I	-	L	Min
Groundwater Quality	Groundwater contamination from malfunctioning sprayfields, sludge storage ponds, sludge disposal sites, septic tank drainfields, percolation ponds	D	-	L	Maj	D	-	L	Maj	D	-	L	Maj	D	-	L	Min
Aquatic Ecosystems	Groundwater contamination in karstic areas impacting subterranean ecosystems and protected species	D	-	L	Min	D	-	L	Min	D	-	L	Min				
	Runoff into lakes, streams and wetlands disrupting aquatic communities	D&I	-	L	Sig	D&I	-	L	Sig	D&I	-	L	Sig	D&I	-	L	Min
	Sedimentation from wastewater management system construction activities may disrupt aquatic communities	D	-	S	Maj	D	-	S	Maj	D	-	S	Maj	D	-	S	Min
Terrestrial Ecosystems	Habitat losses for threatened and endangered species as well as wildlife and plant communities in general due to land conversions for treatment plants, sprayfields and sludge disposal sites	D	-	L	Sig	D	-	L	Sig	D	-	L	Sig				
	Habitat losses due to resultant development	I	-	L	Maj	I	-	L	Maj	I	-	L	Maj	I	-	L	Maj

NOTE: Absence of notation indicates that impact is not caused by that alternative.

1. Positive +
   Negative -
   Neutral o

2. All impacts have been evaluated on the basis of their degree of significance for the study area as a whole.

TABLE IV-[illegible]
IMPACTS ON THE MANMADE ENVIRONMENT

Environmental Parameter	Description Of Impact	Alt.1-L.F.Smith & Northeast				Alt.2-L.F.Smith Regional				Alt.3-L.F.Smith & Southeast				Alt.4-No Federal Action			
		Dir. Ind.	Pos. Neg.1	Short Long	Maj,Sig, Min,Ins 2	Dir. Ind.	Pos. Neg.1	Short Long	Maj,Sig, Min,Ins 2	Dir. Ind.	Pos. Neg.1	Short Long	Maj,Sig, Min,Ins 2	Dir. Ind.	Pos. Neg.1	Short Long	Maj,Sig, Min,Ins 2
Population	90,000 additional persons attracted largely as a result of state government employment, FDR and FVPD. Presence or absence of sewer system irrelevant																
Land Use	Conversion of agricultural lands and open space to urban uses	I	0	L	Maj	I	0	L	Maj	I	0	L	Maj	I	0	L	Maj
	Sprayfields and sludge disposal sites will convert several hundred acres from agricultural/forestry to cropland	D	0	L	Min	D	0	L	Min	D	0	L	Min				
Public Health	Contaminated groundwater from rapid infiltration percolation ponds could enter water wells near some sites surveyed	D	-	S	Maj												
	Transmission of pathogens from sprayfields by wind or vectors	D	-	S	Ins	D	-	S	Ins	D	-	S	Ins				
	Transmission of pathogens from malfunctioning on-site systems by persons or vectors													D	-	S	Min
Economics	New construction related jobs for wastewater mgt. systems or installation of septic tanks	D	+	S	Sig	D	+	S	Sig	D	+	S	Sig	D	+	L	Sig
	New operations and maintenance jobs for wastewater mgt. system, and on-lot systems	D	+	L	Ins	D		L	Ins	D	+	L	Ins	D	+	L	Min
	Economic growth resulting from development	I	+	L	Maj	I	+	L	Maj	I	+	L	Maj	I	+	L	Maj

NOTE: Absence of notation indicates impact is not caused by that alternative.

1. Positive +
   Negative -
   Neutral 0

2. All impacts have been evaluated on the basis of their degree of significance for the study area as a whole.

TABLE IV.20
IMPACTS ON THE MANMADE ENVIRONMENT
(continued)

Environmental Parameter	Description of Impact	Alt.1-T.P.Smith & Northeast				Alt.2-T.P.Smith Regional				Alt.3-T.P.Smith & Southeast				Alt.4-No Federal Action			
		Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]	Dir. Ind.	Pos. Neg.[1]	Short Long	Maj,Sig, Min,Ins[2]
Archeological and Historical Resources	Destruction of pre-historic sites if not surveyed before construction of wastewaters mgt. systems or on-site systems	D	-	L	Sig	D	-	L	Sig	D	-	L	Sig	D	-	L	Min
	Construction impacts on Canopy Roads	D	-	L	Min	D	-	L	Min	D	-	L	Min				
	Destruction of prehistoric sites by urbanization of undisturbed areas in Tallahassee Hills	I	-	L	Maj	I	-	L	Maj	I	-	L	Maj	I	-	L	Maj
Recreation	Loss of hunting areas from land conversions	D&I	-	L	Sig	D&I	-	L	Sig	D&L	-	L	Sig	D&L	-	L	Sig
	Loss of fishing and water contact sports if water quality degraded in lakes	D&I	-	S	Maj	D&I	-	S	Maj	D&I	-	S	Maj	D&I	-	S	Maj
Natural Resource Uses	Resultant development will convert forestry uses to urban uses	I	-	L	Sig	I	-	L	Sig	I	-	L	Sig	I	-	L	Sig
	Crops will be harvested and sold from new sprayfields and sludge disposal sites	D	+	L	Min	D	+	L	Min	D	+	L	Min				
Transportation	Laying of collection lines will disrupt traffic	D	-	S	Min	D	-	S	Min	D	-	S	Min	I	-	S	Ins
	Development will increase congestion until periodic road widenings alleviate situation	I	-	S	Sig	I	-	S	Sig	I	-	S	Sig	I	-	S	Sig
Community Services and Facilities	Development will require periodic expansions of all community services and facilities	I	-	S	Sig	I	-	S	Sig	I	-	S	Sig	I	-	S	Sig

NOTE: Absence of notation indicates impact is not caused by that alternative.

1. Positive +
   Negative -
   Neutral o
2. All impacts have been evaluated on the basis of their degree of significance for the study area as a whole.

CHAPTER V. EIS COORDINATION

A. INTRODUCTION

Public participation programs are mandated by federal regulations governing the preparation of Environmental Impact Statements. Public participation is an important and valuable part of the EIS process in that it provides for active public involvement in developing and evaluating wastewater management alternatives.

At the beginning of the Tallahassee-Leon County EIS, a public participation program was established to provide opportunities for interested groups, individuals and governmental agencies to participate in the development of the EIS. The focal point of this program was the establishment of a Review Committee. This group served in an advisory capacity to EPA and their consultants. Specific functions and duties of the group included:

- Identifying local planning and environmental objectives
- Identifying study area issues and conflicts regarding wastewater disposal and environmental conditions
- Reviewing all task report submissions
- Assisting in the development and evaluation of wastewater alternatives
- Reviewing Draft and Final Environmental Impact Statements

The Review Committee met at regular intervals throughout the development of the EIS. In addition, EPA and their consultants met upon request with individual members of the Review Committee or with the groups they represented.

B. COORDINATION WITH LOCAL, REGIONAL, STATE, AND FEDERAL GRANTS

Throughout the EIS process, it was necessary to contact many agencies-local, regional, state and federal-in order to gather data which aided in the preparation of the various documents produced. Table V-1 is a listing of those agencies contacted and the information made available by them for use in the EIS.

C. PUBLIC PARTICIPATION PROGRAM

The public participation program included one public scoping meeting and four Review Committee meetings. The Review Committee was composed of

TABLE V.1
COORDINATION WITH FEDERAL, STATE, REGIONAL AND LOCAL AGENCIES

Federal Government Contacts

Contact	Purpose
Federal Emergency Management Agency Region IV, Atlanta, GA	Obtain National Flood Insurance Program Rate Maps
U.S. Fish and Wildlife Service Asheville, NC	Obtain protected species information
U.S. Forest Service Tallahassee, FL	Obtain vegetation information about Appalachicola National Forest

State Government Contacts

Contact	Purpose
Florida Dept. of State, Division of Archives, History & Record Management	Obtain archeological and historic survey results
Florida Game and Freshwater Fish Dept.	Obtain fisheries information
Florida Dept. of Environmental Regulation	Obtain water quality information

Regional and Local Contacts

Contact	Purpose
Tallahassee-Leon County Planning Department	Obtain land use, population, socio-economic data. Obtain 208 Plan information
Leon County Department of Public Works	Obtain local floodplain management information
Tallahassee Office of Management and Budget	Obtain capital budgets
Tallahassee Historic Preservation Board	Obtain historic preservation information
Post, Buckley, Schuh & Jernigan, Inc.	Obtain 208 Plan background information

TABLE V-1
COORDINATION WITH FEDERAL, STATE, REGIONAL AND LOCAL AGENCIES
(Continued)

Regional and Local Contacts

Contact	Purpose
Environmental Science & Engineering, Inc.	Obtain 208 Plan background information
Wm. M. Bishop Engineers, Inc.	Obtain 201 Plan background information
Tall Timbers Research Station	Obtain terrestrial ecosystem information
Tallahassee Water Quality Laboratory	Obtain water quality sampling results

23 persons representing 10 public agencies and 13 private groups. A broad range of community interests was included: business persons' groups and trade associations, environmental groups, homeowners associations, and developers. Table V-2 lists the committee membership.

On November 29, 1978, a public hearing (scoping meeting) was held at the R.D. Gray Building in Tallahassee to describe the procedures EPA would use in preparing the EIS. The meeting included presentations on the purpose and background of the EIS, the 201 Study, the scope of the EIS and issues to be addressed, the EIS schedule, and a description of the public participation program. Afterwards, several citizens and officials made comments.

The first Review Committee meeting was held on May 16, 1979 at the Myers Park Community Center to review the EIS Plan of Study. Gaps in the existing data base for terrestrial and aquatic systems were discussed, and the design of a sampling program was presented. The Committee was asked to confirm if all major issues of the EIS had been identified and incorporated into the work effort.

The format of the first Review Committee meeting and all subsequent ones consisted of a presentation by the EIS consultants followed by the Committee dividing into two round table discussion groups. At the end of the evening, a representative from each table summarized the discussion for the benefit of the other table and observers.

The second Review Committee was held on January 9, 1980, at the Myers Park Community Center to review the Environmental Inventory task report and the Alternatives Development task report. The program started with the showing of a 30-minute videotape prepared by the EIS consultants highlighting the issues of local concern and certain aspects of aquatic and terrestrial ecosystems. During the discussion group sessions, Review Committee concerns centered on spray irrigation impacts, wastewater flow projections, the development potential of the northeast portions of the Tallahassee urban area, the desirability of a Northeast wastewater treatment plant, impacts to vegetation and wildlife, and the implementability of widescale use of on-site disposal systems or small community systems.

The third Review Committee meeting was held on January 15, 1981, at the Lafayette Community Center to review the Alternative Evaluation task report. Each of the four alternatives was discussed in turn. Concern focused mainly on Alternative 1 (T.P. Smith/Southwest and Northeast Plants) and Alternative 4 (No-Federal-Action). The widespread use of on-site systems and their maintenance continued to be a matter of concern. Institutional management aspects of on-site systems were perceived to be a serious problem. Other questions addressed cost analyses and wastewater flow projections.

The fourth Review Committee meeting was held on July 9, 1981, at the Myers Park Community Center to present a briefing paper describing the No-Federal-Action Alternative that was selected by the EPA Region IV Regional Administrator. Discussion focused on the need for and responsibilities of a management agency for on-site and small community systems. In addition, committee members requested an expanded discussion in the EIS of causes of system failure, corrective actions, and mitigative measures.

TABLE V.2
TALLAHASSEE-LEON COUNTY EIS

Review Committee

Organization	Representative
Board of County Commissioners Leon County	George Flatt Leon County Dept. of Public Works Division of Utilities Services Leon County Courthouse Tallahassee, Florida 32304
Apalachee Audobon Society	Mr. R. Marvin Cook, Jr. Chapter President P.O. Box 1237 Tallahassee, Florida 32302
Clean Water, Inc.	Ms. Terri Saltiel President 7769 Deep Wood Trail Tallahassee, Florida 32301
Florida Department of Environmental Regulation	Mr. Gerald Neubauer Manager N.W. District Tallahassee Branch Office Twin Towers Office Building 2600 Blair Stone Road Tallahassee, Florida 32301
Florida Wildlife Federation	Mr. C. Richard Tillis Director Office of Environmental Education Knott Building Tallahassee, Florida 32301
Killearn Homes Association	Mr. Philip Anthony 2620 Bantry Bay Drive Tallahassee, Florida 32308
Lakeshore Homeowner's Association	Mr. Estus Whitfield 3515 Sharer Road Tallahassee, Florida 32312
League of Women Voters of Tallahassee	Miss Martha Chapman 129 North Franklin Boulevard Tallahassee, Florida 32304

TABLE V.2
TALLAHASSEE-LEON COUNTY EIS

Review Committee
(Cont'd)

Organization	Representative
Falls Chase Special Taxing District	Mr. J. D. Boone Kuersteiner Attorney-at-Law 115 South Adams Tallahassee, Florida 32302
Leon County Health Department	Mr. Rhett White P.O. Box 2745 Tallahassee, Florida 32301
Munson Area Preseration, Inc.	Mr. Glenn Carter President 1808 Old Briar Trail Tallahassee, Florida 32304
Office of the City Attorney	Mr. Jim English Henry, Buchanan, Mick & English, PA 118 South Monroe Street Tallahassee, Florida 32301
National Wild Turkey Federation	Mr. Charles J. Allen Route 5, Box 3150 Tallahassee, Florida 32301
Sierra Club Florida Chapter, Big Bend Group	Mr. David Allender 1532 Brook Street Tallahassee, Florida
City of Tallahassee	Mr. Michael Schneider City of Tallahassee 201 Program Route 12, Box 9999 Tallahassee, Florida 32301
Tallahassee Area Chamber of Commerce	Mr. Terry Lewis P.O. Box 1876 Tallahassee, Florida 32302
Tallahassee Builders	Mr. John Koelemij P.O. Box 1212 Tallahassee, Florida 32302
Tallahassee Department of Underground Utilities	Mr. Thomas P. Smith, P.E. 2602 Jackson Bluff Road Tallahassee, Florida 32304

TABLE V.2
TALLAHASSEE-LEON COUNTY EIS

Review Committee
(Cont'd)

Organization	Representative
Tallahassee-Leon County Planning Department	Mr. Thomas Pierce Lewis State Bank Building Suite 201 215 South Monroe Street Tallahassee, Florida 32301
Tallahassee Water Quality Laboratory	Mr. William G. Leseman Laboratory Supervisor 2602 Jackson Bluff Road Tallahassee, Florida 32304
U.S. Department of Agriculture Forest Service	Mr. Donald C. Hughes Forest Service P.O. Box 13549 Tallahassee, Florida 32308
U.S. Department of the Interior Geological Survey	Glen Faulkner Water Resources Division 325 John Knox Road Suite L-103 Tallahassee, Florida 32303
Windwood Hills Homeowner's Association	Ms. Elizabeth A. Steenblik 1121 East Windwood Way Tallahassee, Florida 32301

TABLE V-3

LIST OF PREPARERS

U.S. Environmental Protection Agency, Region IV

Robert B. Howard	Chief, EIS Preparation Section
W. Bowman Crum	Current Project Officer
Richard D. Green	Prior Project Officer
Virginia W. Buff	201 Project Engineer

Gannett Fleming Corddry & Carpenter, Inc.

Thomas M. Rachford	Senior Project Manager
Albert T. Bain	Project Manager
Mark Flaherty	Environmental Engineer
Jim Fuller	Environmental Engineer
Sara Frailey	Environmental Engineer
John W. Jacobs	Environmental Scientist
Richard C. Callahan	Environmental Scientist

Claude Terry & Associates, Inc.

Claude E. Terry	Project Executive
Louise B. Franklin	Project Manager, Environmental Planner
Robert J. Hunter	Environmental Scientist
Thomas C. Mather	Environmental Scientist
James C. Hodges	Environmental Scientist
A. Anita Patterson	Environmental Scientist

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